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Crooked River National Grassland Vegetation Management/ Grazing Final Environmental Impact Statement

Crooked River National Grassland

Ochoco National Forest

USDA Forest Service

Jefferson County

Oregon

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RECORD OF DECISION

CROOKED RIVER NATIONAL GRASSLAND VEGETATION MANAGEMENT / GRAZING ENVIRONMENTAL IMPACT STATEMENT

USDA Forest Service
Crooked River National Grassland
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INTRODUCTION

Background of the National Grasslands

The history and past management of the Crooked River National Grassland is not widely known. Yet they have tremendous influence on the vegetation and landscape we see today. In fact, the origin and background of all the National Grasslands are quite different from the rest of the National Forest System.

To facilitate settlement of the Great Plains and other areas of the sparsely populated West, Congress enacted the Homestead Act of 1862 which authorized the disposition of 160-acre parcels of federal land to qualified individuals. To those who met the requirements, the land was free except for filing fees.

The lure of free land brought people to the West in droves. By 1904, nearly 100 million acres had been homesteaded into 500,000 farms. Even more people flocked to rural lands from cities and towns during the Great Depression of the late 1920's and early 1930's. Unfortunately, many settled on land that was poor and unsuited for intensive cultivation.

The hardships of those years are hard to imagine today. Depressed crop prices and drought ruined marginal farms. Burdened by poverty, debt, and lack of opportunity, many people either abandoned their homes or fell behind on tax and mortgage payments. Continual cultivation, recurrent dry years, excessive grazing, and relentless wind changed soils to dust. The infrastructure of communities, counties and States became overburdened.

In 1934 a Federal program to purchase land and provide adequate farm credit brought much-needed relief. The Department of Agriculture worked with State agricultural colleges and State and county officials to identify major problem areas. In these areas the Federal government purchased thousands of uneconomic farms, retired them from intensive cultivation, and helped farm families find new opportunities in other places. These purchases were made through a “land utilization program” that began as a submarginal land purchase and development program but gradually evolved into a program to transfer land to its most suitable use. “Submarginal land” is the term used at that time to refer to lands low in productivity or otherwise ill-suited for farm crops. Such land fell below the margin of profitable private cultivation.

The land utilization program culminated with the passage of the Bankhead-Jones Farm Tenant Act. In 1937 at the height of the New Deal, Congress enacted the Bankhead-Jones Farm Tenant Act to provide a more permanent status for the land utilization program. Title III of the Act authorized the Secretary of Agriculture to "develop a program of land conservation and land utilization, including the retirement of lands which are submarginal or not primarily suitable for cultivation in order thereby to correct maladjustments in land use". When the program ceased for all practical purposes in 1946, the Government had purchased 11.3 million acres – an area equivalent to the combined size of New Hampshire and Vermont.

From 1938 until 1954 the land utilization program had its home in the Soil Conservation Service. Under that agency's leadership, grazing associations and Soil Conservation Districts were organized. Newly-created public ranges were leased under controls guaranteeing range improvement and conservation, and Land Utilization Projects were formed to lead the way in demonstrating conservation techniques and practices.

During the Soil Conservation Service's administration of the land utilization program much of the land in the program was eventually transferred or sold, principally to other federal agencies. Of the original 11.3 million acres, about 5.8 million were gradually transferred to the Department of the Interior to be administered by the National Park Service, the Bureau of Indian Affairs, the Fish and Wildlife Service or the Bureau of Land Management.

In 1954, the Secretary of Agriculture transferred the responsibility for administering 5 million acres retained within the Department of Agriculture from the Soil Conservation Service to the Forest Service. About 1.5 million acres in the South and East were incorporated into new or existing national forests. In 1960, the Secretary designated the remaining 3.8 million acres of Land Utilization Program land as national grasslands. Today these lands are administered by the Forest Service as part of twenty national grasslands in 13 states. The Crooked River National Grassland is the only Grassland in the Forest Service's Pacific Northwest Region.

The Bankhead-Jones Farm Tenant Act of 1937 and Guiding Policy for National Grasslands

The preamble to the Bankhead-Jones Farm Tenant Act stated that its purpose was to create the Farmers' Home Corporation, to promote more secure occupancy of farms and farm homes, to correct the economic instability resulting from some present forms of farm tenancy and for other purposes. Congress was acutely aware of the many problems facing American agriculture in the 1930's. It believed that some of these problems were attributable to the difficulty associated with the purchase and successful operation of a farm, while others were attributable to the continuation of poor or inappropriate farming practices on submarginal land. Through passage of this Act, Congress encouraged and facilitated farm ownership and the removal of submarginal land from cultivation.

Title III of the Bankhead-Jones Farm Tenant Act allowed the Government to purchase submarginal land and take it out of production, to rehabilitate and improve the acquired land which had been ravaged by inappropriate farming practices, and to manage the acquired land for a mix of different uses which were more suitable than farming. This title provided the authority to establish the land utilization program.

There have been some major changes in the Bankhead-Jones Farm Tenant Act over time, most notably the repeal of Titles I, II, and IV, the revision of the goals and objectives of the land utilization program in

Title III, and the elimination of the Secretary's land acquisition authority. The Act nonetheless continues to be one of the principal laws governing the Forest Service's administration of national grasslands.

After amendments added by Congress through the years, Section 31 of Title III now reads:

"The Secretary is authorized and directed to develop a program of land conservation and land utilization, in order thereby to correct maladjustments in land use, and thus assist in controlling soil erosion, reforestation, preserving natural resources, protecting fish and wildlife, developing and protecting recreational facilities, mitigating floods, preventing impairment of dams and reservoirs, developing energy resources, conserving surface and subsurface moisture, protecting the watersheds of navigable streams, and protecting the public lands, health, safety, and welfare, but not to build industrial parks or establish private industrial or commercial enterprises".

In addition to the Bankhead-Jones Farm Tenant Act, there are several regulations which apply to the Forest Service's administration of national grasslands. Foremost among these are the general regulations pertaining to the national grasslands set forth at 36 C.F.R. §213 ("the 213 regulations").

Among other things, the 213 regulations direct that: the national grasslands be "permanently held" by the Department of Agriculture; the national grasslands be administered under "sound and progressive principles of land conservation and multiple use, and to promote development of grassland agriculture and sustained-yield management of the forage, fish and wildlife, timber, water, and recreation resources…"; the national grassland resources be managed to "maintain and improve soil and vegetative cover and to demonstrate sound and practical principles of land use for the areas in which they are located"; and that to the extent feasible, policies for the administration of national grasslands "exert a favorable influence for securing sound land conservation practices on associated private lands".

Forest Service Manual 2200, Grazing Management, also provides policy direction unique to the national grasslands. It states that the national grasslands are to be managed to "promote the development of grassland agriculture and sustained yield management of the soil, water, forage, fish and wildlife, recreation, and timber resources" and "to demonstrate sound and practical principles of land use to favorably influence nearby areas and economies".

History of the Crooked River National Grassland

Initial settlement in the area of the Crooked River National Grassland (Grassland) began in the mid-1800's. Ranching and livestock grazing of sheep and cattle were dominant land uses along with some mineral exploration and limited mining. In 1870, ranchers moved into the Ashwood area just as the first settlers were arriving in the Haystack Butte area. In 1888, the first homestead was patented on the current site of the town of Madras.

The most intense period of homesteading occurred between 1900 and 1925 when the promise of future water and irrigation projects lured many settlers. Several town sites and post offices became established including Grizzly, Lamonta, Opal City, Geneva, and Grandview. Now vanished, the town of Lamonta once boasted a baseball team, dance hall, stage stop, livery stable, several saloons, and a large general store.

Although the first livestock were primarily cattle, sheep soon became dominant. By 1895 an estimated 150,000 head of sheep headquartered in what is now Jefferson County. Around 1930 cattle again became dominant. Many homesteaders on the Grassland also grew dryland grain crops such as wheat, barley, rye, and oats.

During the wet years of the early 1900's, settlement flourished. Homesteaders tell of winters with two to three feet of snow and ample water for growing corn, watermelons, and other crops. However, misery began for the settlers with the advent of drought, crop failures, and the Depression. Many homesteaders were forced into bankruptcy during the 1920's and 1930's and, by 1934, fewer than 50 families remained on the Grassland out of the nearly 700 that had existed three decades earlier.

In 1937 the Federal government purchased approximately 92,000 acres in Jefferson County, Oregon under the authority of the Bankhead-Jones Farm Tenant Act of 1937. During the same year, an additional 13,000 acres of public domain lands and 945 acres of private lands were acquired. These lands were designated as the Central Oregon Land Utilization Project.

In 1938, management responsibility for the Central Oregon Land Utilization Project was given to the Soil Conservation Service. Intensive erosion control and development activities were initiated, including removing homestead infrastructure, installing fences, and developing water sources for livestock. Efforts to reseed and reclaim the eroded farm fields also began. By the 1980's, when reseeding activities were mostly discontinued, about 65,000 acres or one half of the Grassland had been seeded to crested wheatgrass or beardless bluebunch wheatgrass one or more times. Many areas were also sprayed with herbicide to eradicate brush.

In 1954, management responsibility for the Central Oregon Land Utilization Project was transferred to the Ochoco National Forest. The Crooked River National Grassland was officially designated in 1960.

Overview of the Project Area

The Crooked River National Grassland (Grassland) is located entirely within the boundaries of Jefferson County in central Oregon. There are approximately 173,629 acres incorporated within the administrative boundaries of the Grassland. This includes 111,571 acres under the management and administration of the Forest Service. The remainder of the lands within the Grassland administrative boundary are either privately owned or under the administration of the Bureau of Land Management, the State of Oregon, or Jefferson County.

U.S. Highway 97 splits the Grassland from north to south and divides it into two approximately equally sized pieces. U.S. Highway 26 divides the eastern portion of the Grassland from northwest to southeast between the cities of Madras and Prineville.

West of Highway 97, the Grassland is dominated by high plateaus interrupted by the steep canyons of the Deschutes River and its tributaries. East of the Highway, the terrain consists of rolling hills and buttes. Elevations range from 2,241 feet at Madras to 5,108 feet at the top of Gray Butte.

The Grassland lies within the Upper Deschutes, Deschutes/Round Butte, and Lower Crooked River watersheds of the Deschutes River basin. Over the past 20 years almost all of the riparian areas on the Grassland have been fenced to exclude livestock grazing.

Of the 173,629 acres of land of all ownership types within the Grassland administrative boundaries, about 119,763 acres of mixed ownership are included in 23 existing grazing allotments. These 23 allotments are grazed under a permit issued to a single permittee, the Gray Butte Grazing Association (GBGA). The GBGA, as the permittee, assigns and administers grazing permits to its 23 members who currently graze approximately 2,500 head of cattle on the 23 allotments.

Decisions To Be Made

This Record of Decision documents my decisions about:

- the location of treatment areas and the methods that will be used to manage western juniper density and distribution on the Grassland to move towards a more ecologically-balanced mix;
- whether, and to what degree, to reseed, till, drill, and fertilize previously farmed areas to hasten the re-establishment of perennial bunchgrasses and what seed mix to use;
- which of the existing 23 allotments are suitable for continued livestock grazing;
- whether or not to close specific allotments to grazing;
- whether or not to leave certain allotments vacant, and if so, which ones;
- whether or not to create forage reserves from existing allotments, and if so, which allotments; and
- whether or not to modify grazing practices and permits and make changes in permitted livestock numbers, grazing strategies, or allotment/pasture boundaries.

PURPOSE AND NEED FOR ACTION

In March 2003, a watershed analysis was completed that covered the entire Grassland. This analysis resulted in the following recommendations:

- Add a rest rotation grazing system (one pasture of an allotment would be left ungrazed through an entire grazing season) to some of the existing allotments to increase plant growth and productivity, collect more organic matter in the soil, and help promote the rate of ecological succession (the progressive changes in plant communities towards a steady state or more stable plant community).
- Move the pasture fence in the Mud Springs pasture to improve livestock distribution and reduce the amount of grazing on the meadow area next to the stream.
- Rehabilitate about 10,000 acres of old, unproductive crested wheatgrass seedings located primarily within the Willow Creek and Lower Crooked River Valley subwatersheds. If possible, use native plant species and/or appropriate cultivars (a commercially created variety) of native species and non-native plant materials when re-seeding. Another priority identified was the restoration of soils compacted by past farming, homesteading, and grazing activities. The watershed analysis recommended the use of tools like tilling and seeding to reduce compaction in these areas and to increase the rate of recovery.
- Reduce the amount of western juniper woodland to pre-settlement levels (about 20-30 percent of the Grassland) using appropriate tools such as chainsaw cutting and prescribed fire. In certain areas, thin juniper out of shrub and grass stands. In others areas, thin juniper (leaving larger trees) to manage for older juniper stands with a reduced risk of wildfire. The total area of recommended treatment would be about 50,000 acres over the next ten years. The goal of this measure is to maintain grasslands, sagebrush steppe areas, along with a variety of different ages and sizes of juniper trees and juniper tree stands, to provide wildlife habitat for the full range of species known to use the Grassland.
- Do not authorize grazing on the Peninsula, Clevenger, and Goldmine/Falls Allotments and the Squaw Creek Pasture of the Holmes-Squaw Creek Allotment.

- Discontinue re-grazing pastures during the same growing/grazing season (except on the Haystack Butte Allotment where management has proven the ability to meet objectives with re-grazing) to increase plant growth and productivity, collect more organic matter in the soil, encourage native plant species recovery and provide more hiding/nesting cover for ground nesting birds

Purpose Statements

The purposes of this project are to:

- Restore and/or rehabilitate Grassland vegetation to make it more closely resemble pre-settlement conditions.
    - Meet the requirements of Section 504 of the 1995 Rescission Act; requiring National Environmental Policy Act (NEPA) analysis and decisions for all grazing allotments by 2011.
    - Re-authorize grazing on suitable lands (FEIS, Chapter 3, Section 3.9.2.3.3).

Need Statements

Based on the recommendations of the watershed analysis and other information gathered by the team of experts preparing this FEIS, the following management needs were identified.

- ***There is a need; to reduce the density and distribution of western juniper to a more ecologically balanced mix, and to maintain existing sagebrush shrublands and grasslands.***

    - In the late 1990s scientists working for the Interior Columbia Basin Ecosystem Restoration Project (ICBEMP) analyzed changes in vegetation throughout the Columbia River Basin over the last 100 years. They determined that wheatgrass-bunchgrass, fescue-bunchgrass and big sagebrush cover types have decreased significantly (66-75%, 53-92% and 84%, respectively) throughout the region. At the same time, they found that there has been a significant increase in the juniper-sagebrush cover type (163%). These findings led the scientists to identify the sagebrush steppe ecosystem as an imperiled habitat in the Columbia River Basin.

    - A similar trend is occurring throughout Central Oregon, including within the Crooked River National Grassland. Since the turn of the century, western juniper has been actively expanding its range into adjacent shrublands and grasslands. Of the more than 2.3 million acres of juniper woodland in Oregon, nearly 90 percent is composed of young woodlands with trees less than 150 years old (young for trees which have an average life span of 400 to 700 years).

    - A recent comparison between historic vegetation conditions and current conditions conducted by the Grassland found that:

        - The extent of 5-9 inch diameter juniper trees exceeds its historic occurrence;
        - The extent of 9-20 inch and greater than 20 inch juniper trees is less than its historic occurrence; and

- The amount of grassland and shrubland (sagebrush dominated) has declined from historic levels.

- As juniper becomes the dominant plant species on what was a sagebrush/bunchgrass site, many predictable changes may occur. These include:

  - The loss of shrubs such as sagebrush, bitterbrush, and rabbitbrush;
  - The conversion from shade intolerant grasses to shade tolerant grasses (e.g., from bluebunch wheatgrass to Idaho fescue on south-facing slopes); and
  - As the juniper become more dense, deep-rooted native perennial grasses and forbs decline while Sandberg's bluegrass (shallow-rooted native grass) and annual forbs increase. Eventually, perennial grasses can be crowded out.

- At present, 48 percent of the Grassland consists of grass and shrublands. However, most of these areas contain young juniper trees. Without active management (i.e., prescribed fire or thinning) the percentage of grass and shrublands is expected to continue to decrease as more sites become dominated by juniper.

- Wildlife species dependent on sagebrush shrubland habitat such as the sage sparrow and sage thrasher are negatively affected when sites progress from sagebrush steppe (grassland and shrubland) to juniper woodland. Winter forage for mule deer decreases when antelope bitterbrush is out-competed by juniper. Pronghorn antelope prefer "open spaces" that allow them to see predators. Their habitat is lost with increasing juniper numbers and densities.

- Management direction in the Land and Resource Management Plan (LRMP) for the Grassland also emphasizes preserving grasslands and shrublands:

  - <u>Management Area G1 Antelope Winter Range</u> "Antelope winter range will generally consist of open grassland with shrub heights at or below 24 inches, but definitely not over 30 inches in height" (LRMP p. 4-23);
  - <u>Management Area G2 Metolius Deer Winter Range</u> "The forage/cover ratio will be at the optimum level of 60/40 wherever that is possible and will be well distributed. A vigorous shrub component would be present" (LRMP p. 4-23); and
  - <u>Management Area G3 General Forage</u> "The management area will contain the natural composition and cover values of native grasses, sedges, forbs and palatable shrubs. Undesirable forage plants, such as sagebrush and juniper that decreases range productivity will be managed using the tools of fire and livestock to reduce their competition while keeping with multiple use objectives" (LRMP p. 4-25).

- The Grassland's Sagebrush Habitat Restoration Initiative envisions the restoration of the plants and wildlife associated with grasslands and shrublands.

- Old-growth juniper existed historically on the Grassland. Information and photographs from the settlement period suggest that old-growth juniper primarily existed on rocky ridge-tops and other areas where wildfire would not spread naturally. Most of the standing old-growth juniper that existed prior to settlement was cut and used by the homesteaders for fences, firewood, and other uses. Today individual old trees remain, which are either scattered around the Grassland or located in the one identified old-growth stand located on the south slope of Gray Butte. This FEIS does not propose to treat biological old-growth stands, and

individual old growth trees are protected by the project design criteria of the proposed actions.

- **There is a need to restore bunchgrasses and accelerate recovery of previously farmed and heavily disturbed sites.**

    - About one half of the Grassland was dry-land farmed for approximately 40 years during the late 1800s and early 1900s. Then, between 1935 and 1965, 65,000 acres were seeded to non-native plant species such as crested wheatgrass and/or cultivars (a commercially created variety) of native plants such as beardless bluebunch wheatgrass (Whitmar).

    - A range of ecological conditions currently exists on these seeded sites. Some have moved from a monoculture (single species stand) of crested wheatgrass toward historic plant species makeup and structure. The majority of these sites consist of native plants such as: sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Sandberg's bluegrass, and various native forbs.

    - Other sites exhibit slow or no progress (ecological succession) toward native plant associations. Undesirable plants such as: rabbitbrush, crested wheatgrass, and Sandberg's bluegrass (a shallow-rooted native grass) continue to dominate these areas.

    - Scientists working on the Interior Columbia Basin Ecosystem Management Project observed and reported that "another dominant change (throughout the Columbia River Basin) within the dry grass PVG (Potential Vegetation Group) between historical and current was a decline within the upland herblands in the dominance of native bunchgrasses, such as bluebunch wheatgrass and Idaho fescue. With the decline in dominance of the native bunchgrasses came an increase in dominance of smaller-statured bunchgrasses such as Sandberg's bluegrass, an increase in exotic undesirable plants . . . and an increase in exotic seeded grasses (such as crested wheatgrass)." In a letter sent to the Forest Service after a field trip to these sites on the Grassland, Oregon State University professor Tamzen Stringham noted, "the increase in Sandberg's bluegrass has set up a positive feedback loop that promotes the Sandberg's bluegrass community at the expense of deep-rooted perennials"

    - Sandberg's bluegrass cures and dries out earlier than other grass species, making it less palatable. Palatability of forage is a concern in pronghorn winter range. Because its leaves generally grow to no more than two inches in height, Sandberg's bluegrass also provides less structural diversity than deep-rooted perennial bunchgrasses. Structure is a feature important to ground nesting birds such as the horned lark, western meadowlark, and California quail. There is a need to restore bunchgrasses on a portion of these farmed sites by seeding them.

- ***There is a social/economic need to continue livestock grazing on the Crooked River National Grassland.***

    - Today, there are 23 grazing allotments that are grazed under a permit issued to a single permittee, the Gray Butte Grazing Association (GBGA). The 20 members of the GBGA currently graze approximately 2,500 head of livestock on the 23 allotments.

- There is an economic demand for the forage produced on the Grassland. This demand is demonstrated by the yearly stocking of most grazing allotments on the Grassland over the past fifty years.

- Jefferson County is heavily dependent on agriculture. In 2002 livestock sales were more than $7 million. Of the estimated 11,000 cattle in Jefferson County, about 23% (2,500) graze on the Grassland. The Grassland provides forage for these cattle for four to seven months annually. Most of the Grassland livestock permittees farm and/or ranch in Jefferson County near the Grassland. They are fully involved in agriculture as a business and a lifestyle.

- Forest Plans determine the capability and suitability of the plan area for grazing animals and establish programmatic direction including goals, objectives, standards, guidelines, and monitoring requirements. A project-level decision is required to authorize livestock grazing and associated management activities on specific areas or grazing allotments. Section 504 of the 1995 Rescissions Act (Public Law 104-19) requires the Forest Service to establish and adhere to a schedule for the completion of National Environmental Policy Act (NEPA) analysis and decisions on all allotments by 2011. This Record of Decision helps the Forest Service comply with the Rescissions Act directive.

- The Grassland Land and Resource Management Plan and Forest Service policy allow livestock grazing on suitable land. Most of the 23 grazing allotments on the Grassland have demonstrated that they are suitable for livestock grazing. The ecological trend has been generally stable and/or upward. In addition, in the last 20 years most of the riparian areas on the Grassland have been fenced to exclude livestock.

- ***There is a need to leave a diversity of grass stubble heights at the end of the grazing season. A range of stubble heights would provide habitat for ground nesting birds such as the California quail, meadowlark, horned lark, and the burrowing owl. Also, some of the historically homesteaded and farmed sites lack organic matter in and on the soil. Leaving sufficient stubble at the end of the grazing season helps accumulate organic matter.***

  - Most of the grazing allotments on the Grassland have used modified deferred rotation grazing systems (using several pastures one after the other with at least one pasture being grazed after grass seed has ripened on the stalk) during the past decade. Most allotments have six to nine pastures. Each allotment has one herd of livestock that moves through the pastures with the objective of grazing half of the annual growth (50 percent utilization by weight). On many allotments, re-grazing the first grazed pasture is part of the existing Allotment Management Plan. Re-grazing is designed to capture (graze) the plant re-growth that occurs after the pasture has been grazed early in the season.

  - The practice of re-grazing pastures produces evenly used pastures but does not generally leave stubble heights over four inches. Although livestock use is more evenly spread across the landscape, habitat for ground nesting birds is greatly reduced. Many ground dwelling birds need taller (greater than six inches) grass to provide hiding cover for nests as well as over wintering habitat and hiding cover from predators.

- Discontinuing the re-graze option and establishing rest pastures would result in a range of stubble heights (from 4 to 14 inches) across each allotment at the end of the grazing season. This would, in turn, result in greater habitat diversity across the Grassland and help provide habitat conditions for a wide array of wildlife species that depend on taller stubble heights. It also would help meet the Grassland's Land and Resource Management Plan direction for MA-G1, Antelope Winter Range to "have an abundance of fall green up left for antelope winter use".

- In addition, using a rest rotation grazing system on certain allotments would increase the collection of organic matter on the soil surface and enhance forb, grass and shrub seed production and the health and establishment of deep-rooted native perennial plants. Adding rest pastures would also increase the diversity of stubble heights left at the end of the grazing season. A diversity of stubble heights provides better hiding and nesting cover for birds and small mammals. Finally, adding a rest pasture would increase forage production because individual plants would be allowed to build reserves stored in their root system and increase plant health and productivity.

- ***There is a need to close livestock grazing on certain allotments.***

  - **Peninsula Allotment** There is a need to stop allowing grazing on this allotment because of downward ecological trends. In addition, all range improvements including fences, pipelines, and stock tanks are in disrepair. This allotment is located on a peninsula with a single entry point and access limited to only one route through a large subdivision. Two private in-holdings within the allotment are currently being developed into residential areas. No fences separate the private land from the Grassland.

  - **Clevenger and Goldmine/Falls Allotments** There is a need to stop allowing grazing on these allotments because both have been vacant (not had a permittee) for more than ten years and there is no demand for the use of either one. In the past they were grazed with adjacent private land. As this does not appear to be possible any longer, starting grazing would require extensive fence construction and the development of watering facilities. In addition, both allotments are partially within the boundaries of the Middle Deschutes Wild and Scenic River corridor (livestock are not allowed to graze within the canyon portion of the corridor).

  - **Squaw Creek Pasture of the Holmes-Squaw Creek Allotment** There is a need to close this pasture to grazing because the combination of; occupied bull trout habitat, steelhead essential habitat, and management of the canyon portion of Squaw Creek as a scenic corridor; make grazing of this pasture unfeasible.

PUBLIC INVOLVEMENT AND CONSULTATION WITH TRIBES

Scoping and public involvement are ongoing processes used to invite public participation and to obtain input on the scope of the analysis, alternatives to be evaluated, and issues to be addressed (40 CFR 1501.7). The official scoping process for this analysis was initiated on February 18, 2003 when the Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register.

On January 24, 2003 a scoping letter was sent to 159 individuals, organizations, and agencies. It included the proposed action, management summaries, and preliminary issues and concerns associated with the proposed actions and activities. Input concerning the proposed actions was solicited. Notices soliciting comment were published in the Madras Pioneer, Central Oregonian, and Bend Bulletin newspapers. Thirty letters and nine phone calls were received in response to scoping efforts.

On April 23, 2003 staff from the U.S. Fish and Wildlife Service office in Bend, Oregon toured the Grassland to discuss the proposed vegetation and management actions.

On May 20, 2003 staff from the Grassland conducted a field tour for various interested parties to discuss management of western juniper and old growth juniper. Attendees included members of the Crook County Natural Resources Committee, Oregon Department of Fish and Wildlife, Oregon State University Extension, Bureau of Land Management and others. The Oregon Natural Desert Association (ONDA) and the Native Plant Society of Oregon were invited but did not attend. Notes from that field trip were faxed to ONDA, and another invitation to tour the Grassland was extended to them in August 2003 but they did not express interest in a tour. On January 27, 2004 the Grassland gave a presentation to the Central Oregon Chapter of the Native Plant Society of Oregon and conducted a field trip with them on June 12, 2004 to discuss western juniper management and rehabilitation of previously farmed sites.

On May 21, 2003 a follow-up letter was sent to the people and organizations who commented on the Proposed Action informing them of our progress on alternative and issue development. No comments were received in response to this mailing. That same day, Grassland staff attended a meeting with the Redmond Chapter of the Oregon Hunters' Association and the Gray Butte Grazing Association to update them about our progress.

The project has also been included in each ***Schedule of Projects for the Ochoco and Deschutes National Forests and the Prineville District of the Bureau of Land Management*** since the Spring issue of 2003. The Schedule of Projects is mailed quarterly to approximately 3,200 individuals or organizations. The project was also posted on the combined Deschutes and Ochoco National Forests and Crooked River National Grassland internet website.

The Notice of Availability for the Crooked River National Grassland Vegetation Management/Grazing Draft Environmental Impact Statement (DEIS) was published in the Federal Register on April 9, 2004. Public Notices briefly describing the analysis were published in two local newspapers and a press release was provided to the media. The press release provided information about the time and location of an Open House, the opportunity to submit comments on the DEIS, a summary of the proposed actions, who to contact and how, a brief history of the Grassland, and the location of the DEIS on the internet.

The Forest Service is required to send complete copies of any DEIS to various Federal and State agencies. The DEIS was sent to 31 representatives of state and federal agencies and nine tribal representatives. A list of interested persons and organizations requesting a copy of the DEIS was compiled throughout the analysis process. A copy of the DEIS was sent to 152 interested parties. The DEIS was distributed in both hardcopy and electronic format. The DEIS was also available for review on the World Wide Web.

Following the release of the DEIS, meetings were conducted with the Gray Butte Grazing Association, and an Open House meeting was conducted on April 17, 2004 to present the DEIS to the public. Nine people including Grassland personnel attended the meeting. The Open House meeting provided the public an opportunity to submit comments and obtain a copy of the DEIS if they desired one.

Comments were provided by 24 individuals and organizations from: the Open House, telephone contacts, and letters. All substantive comments were considered. Comments considered and responses are recorded in Appendix X of the Final Environmental Impact Statement (FEIS).

Consultation with Tribes

I initiated government-to-government consultation with Tribes in the early stages of the planning process.

In January 2003 a letter was sent to the Burns Paiute and Klamath Tribes informing them of the project and requesting their comments, suggestions, and concerns. A letter was also sent to the Confederated Tribes of the Warm Springs Reservation in Oregon requesting the same information. No response was received from the Burns Paiute or Klamath Tribes.

Letters were not sent to either the Confederated Tribes of the Grand Ronde or the Confederated Tribes of the Umatilla. The Confederated Tribes of the Grand Ronde indicated to us in a phone conversation that they were not interested in projects east of the crest of the Cascades. A phone call to the Confederated Tribes of the Umatilla also indicated that they had no concerns about the project as they considered it outside their area of interest.

On April 3, 2003 the Confederated Tribes of the Warm Springs Reservation in Oregon (CTWSR) Cultural and Heritage Committee toured the Grassland. Proposed vegetation treatment project sites were visited, livestock grazing was discussed, and cultural plants were identified and dug for personal use. On April 15, 2003 two members of the CTWSR visited the Grassland with a Forest Service archaeologist to dig plants for personal use and discuss a variety of topics.

On May 5, September 7, and September 21, 2004 additional government-to-government consultation occurred about this project during coordination meetings held between the Tribes and the Forest Service.

Under the 1855 Treaty with the Tribes of Middle Oregon, the CTWSR retain certain rights related to a variety of resources. The Treaty of 1855 contains the following provision:

"That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations, in common with citizens of the United States, and of erecting suitable houses for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them."

Included in this decision are project design criteria to protect cultural plants. Specifically, pre-disturbance surveys of high-probability habitat for cultural plants will be conducted on 20 percent of the areas to be seeded. In addition, when cultural plant populations and/or habitat are encountered during vegetation management project planning, layout or execution they will be protected. Consultation with the Tribes will occur on an ongoing basis to ensure that all cultural values are being protected during implementation of this decision.

My decision is guided by the Federal government's treaty responsibility to the Tribes. Because treaties are the law of the land, the Forest Service has an obligation to manage National Forest resources in a manner that harmonizes the Federal trust responsibility to Tribes and the statutory mission of the agency. This is one of several legal obligations that I considered as I made my decision. In their comments on the DEIS, the CTWSR expressed their support for significant juniper removal and other vegetation management actions which enhance native plants and habitat for wildlife, particularly pronghorn.

ISSUES

Though there is broad-based support for the purpose and need of the project, six key issues related to concerns over the effects of the proposed activities were identified by the Forest Service interdisciplinary team either through their own deliberations or in response to issues raised by the public. Issues are points of discussion, debate, or dispute about environmental effects. A key issue is one that is used to formulate alternatives, prescribe mitigation measures, or analyze environmental effects.

The following six key issues were used to develop alternatives to the Proposed Action or to modify all of the action alternatives by incorporating project design criteria. These issues are not listed in any order of priority:

Issue 1

- If not managed properly, livestock use can cause downward ecological trends and, therefore, loss of wildlife habitat.

Issue 2

- Proposed soil-disturbing activities such as tilling, prescribed fire, mechanical juniper removal, and grazing have the potential to increase the amount and distribution of noxious weeds and invasive plants.

Issue 3

- Proposed management activities such as tillage, prescribed fire, juniper control, and grazing have the potential to affect water quality and quantity by changing upland and riparian vegetative cover and complexity.

Issue 4

- Proposed management activities (grazing, tilling/seeding/fertilization, prescribed fire, and juniper control) may affect the quality, quantity and distribution of wildlife habitat, specifically mule deer and pronghorn LRMP designated winter range (Map 16 - LRMP Management Area Map).

Issue 5

- Manipulation of western juniper on the Grassland (how many acres and the size and location of juniper to be cut) can affect visual qualities, old growth, and habitat diversity values.

Issue 6

- Grazing domestic sheep in potential bighorn sheep habitat increases the risk of transmitting disease if bighorn sheep are reintroduced to their historic habitat on the Grassland.

Three additional issues were raised during scoping, evaluated by the Interdisciplinary Team, and determined to be issues important to the project but not significant. They were not used as the basis for alternative development because they were resolved in other ways (for example, by incorporating project design criteria). The discussion of these issues can be found in Chapter 1 of the FEIS, Section 1.9.

DECISION

Based upon my review of all the alternatives, I have decided to implement Alternative C as described, and analyzed in the FEIS, with some modifications. I will refer to my selected alternative as, "Alternative C-Modified".

Alternative C - Modified meets the purpose and need for the project while incorporating some important adjustments to respond to public comments and issues. In this decision I incorporate the juniper

management and seeding actions included and described under Alternative C of the FEIS, and the livestock grazing management actions as described in Alternative D.

The specific management activities included in Alternative C - Modified, are described below. Table ROD-1 summarizes the vegetation management and grazing decisions I have made. Table ROD-2 displays these management activities by allotment. Map ROD-1 Alternative C Modified shows the location of the treatment areas included in this decision.

Table ROD-1

VEGETATION TREATMENTS/GRAZING DISPOSITION		Alternative C-Modified
Acres of Juniper Density Control - chainsaw		27,095
Acres of Juniper Density Control - chainsaw/prescribed fire		5,196
Acres of Sagebrush/Juniper cover control - prescribed fire		7,510
Acres of Sagebrush/Juniper cover control - mechanical		488
Acres of Juniper Control as part of seeding treatments - chainsaw		8,344
	Total Acres of Juniper Control	48,633
	Total Acres of Till/Seed/Fertilize	8,344
	Total Acres of Vegetation Treatment	48,633
Acres Open to Domestic Livestock Grazing		82,923
Acres Vacant to Domestic Livestock Grazing		1,592
Acres Closed to Domestic Livestock Grazing		18,423
Acres in Forage Reserve		0
Total Acres		102,938

Table ROD – 2 Alternative C - Modified, Management Activities

		ES						PROPOSED GRAZING ACTIONS				
NAME	ACRES	Juniper Control-Chainsaw	Juniper Control-Chainsaw / Prescribed Fire	Sagebrush /Juniper Control-Prescribed Fire	Juniper Control with Seeding	Seeding	Mech. Treatment Shrubs – Fuel Break	Acres Open to Grazing	Acres Closed to Grazing	Acres of Vacant Allot-ments	Authorized AUMs	Grazing System
Blanchard	7,694	3,952	880	1,591	0	0	0	7,694	0	0	2,113	Rest Rotation
Boyce	5,653	0	0	0	3,175	3,175	0	5,653	0	0	1,878	Rest Rotation
Canadian Bench	1,592	0	0	0	0	0	0	0	0	1,592	0	Season Long
Clevenger	638	0	0	639	0	0	0	0	638	0	0	Closed
Cotter Pond	197	0	0	0	0	0	0	197	0	0	40	Season Long
Cyrus	9,325	2,311	0	414	0	0	0	9,325	0	0	1,878	Rest Rotation
Devine	80	0	0	0	0	0	0	80	0	0	7	Season Long
Fox/Dump	6,225	2,565	548	0	351	351	0	6,225	0	0	1,641	Rest Rotation
Goldmine/Falls	720	812	0	0	0	0	0	0	720	0	0	Closed
Gorge	1,182	0	0	0	214	214	0	1,182	0	0	142	Deferred Rotation
Grizzly	9,179	1,664	0	0	0	0	0	9,179	0	0	2,348	Rest Rotation
Haystack	4,835	708	0	0	0	0	0	4,835	0	0	1,784	Short Duration
Holmes-Williams	2,620	386	257	0	0	0	0	2,620	0	0	411	Straight Rotation
Juniper Butte	2,719	1388	0	0	701	701	0	2,719	0	0	430	Deferred Rotation
Kennedy	700	730	0	0	0	0	0	700	0	0	264	Season Long
Lone Pine	9,222	2,325	718	321	272	272	0	9,222	0	0	1,878	Rest Rotation
Lower Desert	10,190	1,765	2,172	0	0	0	0	0	10,190	0	0	Rest Rotation
East Winter	1,521	0	0	0	0	0	0	1,521	0	0	83	Straight Rotation
North	10,251	1,671	621	1,905	484	484	0	10,251	0	0	2,802	Rest Rotation
Peninsula	1,680	1,226	0	526	0	0	0	0	1,680	0	0	Closed
Round Butte	2,494	1,014	0	362	0	0	488	2,494	0	0	423	Rest Rotation
Rush	6,497	2,214	0	0	1,751	1,751	0	6,497	0	0	1,614	Rest Rotation
Squaw Cr. Pasture	5,195	549	0	1,752	0	0	0	0	5,195	0	0	Closed
Steer	2,291	923	0	0	1,396	1,396	0	2,291	0	0	533	Deferred Rotation
Weaning Pasture	238	0	0	0	0	0	0	238	0	0	20	Season Long
Other		892	0	0	0	0	0	0		0	0	N/A
TOTALS	**102,938**	**27,095**	**5,196**	**7,510**	**8,344**	**8,344**	**488**	**82,923**	**18,423**	**1,592**	**20,289**	

Western Juniper Management

Up to 49,000 acres of western juniper density management actions will be implemented over the next ten years using: chainsaw cutting, prescribed fire, mechanical methods, or a combination of the three, as outlined in Table ROD-1, Table ROD-2 and the prescriptions listed for Alternative C in Appendix E of the FEIS.

During vegetation treatment planning, layout and execution all biological old growth (pre-settlement) juniper trees will be retained. No treatments will occur in any of the Forest Plan-designated old growth juniper areas. Existing designations of old growth juniper management areas will be revisited in the upcoming Forest Plan update.

Project design criteria for implementation of juniper treatments are summarized below. All the criteria for Alternative C pertaining to western juniper management (FEIS, Chapter 2, Section 2.5) will be applied to this decision.

- ***Slash Treatment*** - In thinned areas juniper branches will be lopped and scattered unless the area will be subsequently tilled and seeded. Where tilling and seeding occurs, cut juniper will be removed from the site and either piled and the piles left as wildlife cover or lopped and scattered.

- ***Prescribed Burning*** - Prescribed burning following juniper treatment will occur at least seven years after the treatment when doing so meets fuels management and seeding objectives. In areas where fuels management or seeding objectives require, prescribed burning may occur sooner than seven years. Burning in existing sagebrush stands will be delayed until replacement stands are established on adjacent juniper treatment areas. Grassland Land and Resource Management Plan standards and guidelines for detrimental soil conditions will be met during and following prescribed burn operations.

- ***Mechanical Treatment*** - A brush beater or shrub mowing equipment will be used on 488 acres to treat small-sized sapling juniper/sagebrush canopies. The intent of this treatment is to allow islands of native grasses to become established in areas with heavy shrub cover.

- ***Developed Recreation*** - Treatments planned for campgrounds will meet the assigned Recreation Opportunity Spectrum (ROS) classifications (defines limits on, and visibility of use of motorized equipment) for the area and will meet Visual Quality Objectives (VQOs) of Retention. Treatments within developed campgrounds will maintain shade and vegetative screening between campsites. Vegetative treatments adjacent to developed recreation facilities will be implemented in a manner to make them not evident to a casual forest visitor.

- ***Dispersed Recreation*** - Treatment areas directly adjacent to dispersed sites will meet the assigned ROS classifications for that area. The VQO of Retention will be met. Slash from juniper thinning will be removed and piled out of sight of the dispersed site, then burned.

- ***Recreation Trails*** - Juniper thinning and/or prescribed burning on or adjacent to constructed trail features will maintain a mosaic of tree cover and retain shade and visual variety. All vegetative treatments along trail corridors will meet the assigned ROS classifications and VQOs for the surrounding area. Where the assigned VQO is Retention, slash from juniper thinning along trails will be removed and piled out of sight, a minimum of 50 feet away from the trail on either side of the trail corridor. If existing trees and vegetation along trail corridors are removed

where they are providing management control (i.e., help regulate off-trail use), other control devices will be installed. Trail tread impacted by tilling, seeding, or vegetative treatments will be reconstructed to Forest Service standards and specifications. Salt for livestock will not be placed adjacent to trails.

- ***Middle Deschutes and Lower Crooked Wild and Scenic River Corridors, Squaw Creek Management Area, Cove Palisades State Park and Lake Billy Chinook View Area -*** Treatment of sites within or directly adjacent to these areas will meet the Recreation Opportunity Spectrum (ROS) classifications and Visual Quality Objectives defined in the LRMP and Area/Corridor Management Plans. Where juniper slash is piled and burned it will be done in a manner to make it not visually evident.

- ***Recreational Special Uses -*** Implementation actions will be scheduled to reduce or eliminate conflicts with existing or planned permitted recreational special uses.

Seeding

I have decided to rehabilitate a portion (8,344 acres out of 65,000 acres, or about 13 percent) of previously farmed and disturbed sites in the next ten years. Only up to 50 percent of a unit will actually be treated; therefore, the "footprint" of treatment will be closer to 4,200 acres or about 6.5 percent of the 65,000 acres of previously farmed sites. The other half of each treatment unit will be left untreated to; preserve existing remnant sagebrush stands, create a mosaic of habitats, and provide an on-site native seed source.

The first rehabilitation treatments will be implemented on a trial basis. The Forest Service, in cooperation with interested partners, will use these trials to evaluate the success of various site preparation techniques, seed mixtures and fertilizer formulations. Trial size will generally be a minimum of 10 acres. Project design criteria for implementation of seeding treatments are summarized below. All criteria outlined in Alternative C (FEIS, Chapter 2, Section 2.5.7) will be applied to this decision.

- ***Trial Design and Implementation -*** The trials will be assessed three years following treatment to evaluate results, including the establishment and survival of the seeded species and cost-effectiveness. If a particular combination of treatments does not meet objectives (i.e., does not provide the desired results) the methods will be modified and re-tested.

- ***Treatment Methods -*** Methods to be used include tilling (to 10 inch soil depth) with a farm or crawler tractor pulling rangeland discs, drilling (to a depth of 1-3 inches) using a rangeland drill pulled by a farm or crawler tractor, broadcast seeding, and/or fertilizing. Fertilizer will be used only where soil tests find that soil nutrients are lacking, and test plots will be established to determine vegetation response to various fertilizer application rates and formulations. Up to 4,170 acres may be fertilized, depending on soil analysis results. The type of fertilizer used initially will likely be a 16-16-16-20 (Nitrogen-Phosphorous-Potassium-Sulfur) formulation, with trace elements added dependent upon soil analysis results. Fertilizer will be applied using ground-based equipment at a rate of 100 to 200 pounds per acre (again, depending on soil analysis results).

  Where tilling occurs, all post-settlement aged juniper trees will be removed prior to tilling. All old growth juniper trees will be retained and, on occasion, large post-settlement junipers will be

left to provide visual and habitat diversity. Up to 50 percent of a unit will actually be treated; the remainder will be left untreated to preserve existing remnant sagebrush stands and serve as a reservoir for vesicular arbuscular mychorrhizae in the soil. The combination of treated and untreated areas within a unit will create a mosaic of habitats and provide an ongoing native seed source. Protective buffers as specified in the Inland Native Fish Strategy Environmental Assessment, (INFISH, 1995) for Class 1, 2, and 3 RHCAs will be utilized for seeding treatments. Tilling will be done on the contour across the prevailing wind direction.

- ***Seed Mixtures -*** A minimum of five of the trial plots will be seeded with a 100 percent native seed mix within the first five years of implementation. As a goal, at least 10 percent of the 8,344 total treatment acres would be seeded with a 100 percent native seed mix unless the results of the trials show that a 100 percent native seed mix cannot be successfully used or it is cost-prohibitive. On the remaining area a mixture of natives and cultivars will be used. When treating especially degraded sites (e.g., sites dominated by medusahead or severely eroded farm fields), some non-native species comprised of cultivars and exotics will be given priority. No unit will be seeded 100 percent to non-native species. Antelope bitterbrush will be planted in all treatment areas at the same time as seeding occurs. My preference is to use native species as much as is practical.

  Native seed mixtures will include locally-collected native seed that is increased by a contracted grower and/or source-identified local seed that is locally collected from a broader area and produced for commercial sale by growers. The native seed mix will include the following species: antelope bitterbrush, bluebunch wheatgrass, bottlebrush squirreltail, Idaho fescue, western wheatgrass, wildrye, Thurber's needlegrass, buckwheat, yarrow, and biscuitroot.

  Cultivar/native seed mixtures will include source-identified local seed that is locally collected from a broader area and produced for commercial sale by growers; locally-collected native seed that is increased by a contracted grower; or cultivars of native species. The cultivars that will be used are: Whitmar beardless bluebunch wheatgrass, Antone bluebunch wheatgrass, and Sherman big bluegrass.

  Exotic species such as crested wheatgrass will be used on especially degraded sites. Clover and range alfalfa will be added to cultivar/native seed mixtures to enhance nitrogen-depleted farmed soils and improve wildlife forage quality.

- ***Timing of Seeding and Subsequent Livestock Management -*** Seeding will be conducted from November through February and be applied with rangeland drills (as one option). Seeded sites will be rested from livestock grazing for two years.

Livestock Grazing Management

I have decided to implement the livestock grazing management practices included in Alternative D, with one modification. In Alternative C-Modified, I have reduced the amount of the Lower Desert Allotment left open for livestock grazing and determined that the 15 miles of fencing included in Alternative D (associated with the Lower Desert Allotment) will not be constructed.

Livestock grazing will be authorized on 82,923 acres within 20 allotments. The upper limit for authorized livestock stocking will be 20,621 animal unit months (AUMs). Actual numbers and length of the grazing period will depend upon annual growing conditions and meeting stubble height standards. New allotment

management plans will be written and a new 10-year grazing agreement will be issued to the Gray Butte Grazing Association in conformance with this Record of Decision and the parameters outlined herein.

- ***Rest Rotation Grazing*** **-** As noted below, ten allotments will be managed under a rest rotation grazing system. In these allotments, pastures where crested wheatgrass is the key plant used for utilization measurement may or may not be rested during a rest-rotation grazing plan at the discretion of the Grassland. Too much rest of crested wheatgrass creates an unpalatable plant that becomes "wolfy" and stagnant. Minimum stubble height standards may be adjusted to meet specific ecological, structural or pasture needs. For example, on a given year a pasture dominated by crested wheatgrass that has not been grazed early for two or three years may require early intense grazing in order to return palatability to the forage and vigor to the stand. In this case a two-inch stubble height early in the season (versus three inch stubble height) may be prescribed. This non-rest of a planned rest pasture is estimated to occur on two pastures per year out of a possible 80 pastures or approximately two percent of the grazed acres. In the event that a crested wheatgrass pasture is not rested, a native grass or seeding pasture will be rested instead. Therefore, in all allotments with a rest rotation system one pasture will be rested each year.

- ***Rest Following Vegetation Management Activities*** **-** Areas that are reseeded will be rested (not grazed) for a minimum of two growing seasons to assure seedling establishment and rooting. After prescribed burns (not including slash pile burning), areas will be rested for a minimum of two growing seasons. Resumption of livestock grazing after prescribed burning will be approved by the District Ranger in coordination with the Grassland wildlife biologist and range conservationist. The length of the rest period will depend upon:

    - Pre-fire ecological condition.
    - Post prescribed burn conditions and results.
    - Size of the prescribed burn in relation to entire pasture size.
    - Vegetation response to the prescribed fire.

- ***Allotment Specific Management***

    - Graze two allotments (**Gorge** and **Steer**) with a form of deferred rotation grazing.
    - Graze two allotments (**East Winter** and **Holmes-Williams**) under a straight rotation grazing system.
        - The **East Winter and West Winter Pastures** in the **Lower Desert Allotment** (1,521 acres of Grassland-administered lands) will be open to grazing and will be renamed the **East Winter Allotment**. This allotment will be managed to maintain and/or enhance the quality of mule deer winter range forage. (Map 9 - Alternative C - Proposed Action). Bitterbrush is a key wildlife browse species on the winter range. Monitoring livestock's annual use of bitterbrush would be required. Monitoring would assure that sufficient bitterbrush leaf and leader growth would be left following livestock grazing for deer browse and for shrub health (FEIS, Chapter 2, Section 2.4.3). Domestic livestock use would generally not be allowed after August 1 to eliminate potential conflicts between livestock and mule deer needs. The **East and West Winter Pastures** are presently permitted to an active permittee. The remainder of the **Lower Desert Allotment** (6,683 acres) will be closed to livestock grazing, no fencing will be constructed, and no forage reserve will be established.

        - **The Holmes Pasture** in the **Holmes-Squaw Creek Allotment** would be combined with the **Williams Allotment**. The new allotment, named the **Holmes-Williams Allotment**, would have two pastures totaling 2,620 acres. This allotment is within the Metolius Deer Winter Range; therefore, livestock would generally be off of the allotment prior to August 1.
        - The **Squaw Creek Pasture** (5,195 acres) would remain closed to grazing (Map 9 - Alternative C - Proposed Action). Grazing will not be allowed within the Squaw Creek Pasture to avoid occupied bull trout habitat and essential steelhead habitat, and to prevent grazing within the proposed scenic portion of the Squaw Creek corridor.
    - Divide the **Juniper Butte Allotment** into two new allotments**; Juniper Butte** to the west and **Haystack** to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line. This change is needed, as Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway.
        - Graze the new **Haystack Allotment** (Juniper Butte east of Hwy 97) under a short duration grazing system.
        - Graze the new **Juniper Butte Allotment** (Juniper Butte west of Hwy 97) under a rest rotation grazing system.
    - Graze nine allotments (**Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, North, Round Butte, and Rush**) with a rest rotation grazing system. This action would increase the collection and buildup of organic matter in and on the soil needed to: restore deep-rooted native bunchgrasses, increase the variety of stubble heights left following grazing, and aid the health and productivity of the existing plants.
        - Move the **Mud Springs Pasture** boundary fence in the **Fox Allotment** to more evenly spread livestock use across the landscape and reduce grazing on the Mud Springs Flat area. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).
    - Graze four allotments/pastures (**Cotter Pond, Devine, Kennedy, and Weaning**) under a season long grazing system (one pasture with short grazing seasons).
    - Manage the **Canadian Bench Allotment** (1,592 acres of Grassland) as a vacant allotment (unassigned and unoccupied) under this alternative. There is currently no demand for this allotment due to its lack of boundary fences and water developments.
    - Stop allowing livestock grazing on five allotments/pastures (**Clevenger, Goldmine/Falls, and the Peninsula Allotment, the Squaw Creek Pasture of the Holmes – Squaw Creek Allotment** and **portions of the Lower Desert Allotment**) totaling 8,233 acres of the Grassland (Map 10 - Alternative D).
        - The portions of the **Lower Desert Allotment** proposed to be closed include the **Geneva, Airstrip, and Dry Lake Pastures**.
        - Two cattleguards would be removed from closed allotments using a backhoe.

The Gray Butte Grazing Association will continue to be responsible for maintaining the following rangeland improvements on the Grassland:

- Approximately 750 miles of existing fences including 550 miles of allotment boundary fence and 200 miles of division fence.
- About 2 miles of new division fence.
- Approximately 30 road cattleguards.
- Approximately 100 miles of buried water pipelines.

- 29 wells.
- 175 livestock/wildlife water developments.

Livestock control fences, cattleguards, and other structural range improvements will be protected during vegetation treatments and, if damaged, will be restored to pre-treatment condition.

- ***Utilization Standards -*** Utilization of forage by livestock will be measured using stubble height. Livestock will be moved from each pasture prior to meeting stubble height standards. Table ROD-3 displays the stubble height standard for each key plant species and the dates for which each standard is appropriate.

Table ROD-3 Forage Stubble Height Standards (Utilization)

Species	Date	Stubble Height (Inches)
Crested/Bluebunch Wheatgrass, Whitmar	Before June 1	3
	After June 1	4
Idaho Fescue	Before June 1	3
	After June 1	4
Kentucky Bluegrass	Before June 1	2
	After June 1	2

Stubble height will also be used as the year-end target. Year-end target guidelines are used to make management adjustments and meet project design criteria for the protection of Threatened and Endangered fish and wildlife species (see section below). Table ROD-4 displays the stubble height standard used for each species.

Table ROD-4 Year-End Stubble Height Standards (Utilization)

Species	Stubble Ht (Inches)
Crested/Bluebunch Wheatgrass, Whitmar	4
Idaho Fescue	4
Kentucky Bluegrass	2

If stubble height standards are not met and unsatisfactory conditions are attributable to livestock, adjustments will be made to the next year's grazing use. One of the following types of adjustments will be made: resting pastures, adjusting rotations, increasing stubble height retention requirements, creating riparian pastures/exclosures, reducing numbers, requiring a full time rider, or reducing the length of the grazing season.

- ***Project Design Criteria for Livestock Grazing in the "Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands within the Deschutes and Ochoco National Forests 2003-2006".*** These criteria, which are listed below, will continue to be followed unless modified by a subsequent Biological Assessment:

- Exclude livestock from streams with bull trout spawning habitat from January 1 to May 15 and from August 15 to December 31 each year to protect bull trout. Exclude livestock from streams with steelhead spawning habitat from February 15 to July 15.
- Conduct pasture moves before the alteration condition threshold (trigger) is reached or before the assigned Forage Stubble Height standard is reached. Separate consultation will be required in cases (e.g., specific allotments) where the standards are not met for two consecutive years.
- Monitor 100 percent of Category I pastures and a minimum of 35 percent of Category II pastures annually (see FEIS, Chapter 2, Section 2.4.1 for a definition of Category I and II pastures).
- Manage seeps and springs using Class 3 and 4 RHCA protective buffers as specified in Inland Native Fish Strategy Environmental Assessment.

This decision complies with all the project design criteria in the Biological Assessment.

Cultural Resource Protection

Prior to implementing any ground disturbing project, an archaeologist will review the project to insure protection of cultural values.

When viable cultural plant populations (such as a patch of *lomatium* of one quarter acre or more) or cultural plant habitats are encountered during vegetation management project planning, layout, or execution, they will be avoided**.** In addition, in areas to be seeded or prescribed burned, twenty percent of the 8,100 acres identified in the FEIS, as high probability cultural plant habitat will be surveyed prior to project implementation.

All areas that have a high probability of containing cultural properties and are located in undisturbed areas within proposed seeding and prescribed fire treatment units will be surveyed for cultural properties before projects layout begins. Known cultural properties, both eligible and potentially eligible for the National Register of Historic Properties, located within seeding treatment units will be protected by avoidance. Known cultural properties within prescribed fire treatment units will be protected by avoidance if the temperature would exceed 400 degrees Celsius and the site has not been burned historically.

Noxious Weed Detection and Prevention

A Grassland-wide invasive plant species inventory will be maintained and updated annually. This inventory will be used during project planning, layout and execution to identify/verify sites and to determine appropriate avoidance strategies or mitigation measures.

Weed identification training will be conducted for all personnel who prepare, implement, and/or administer vegetation management projects. During implementation, all weed locations will be documented. Pre- and post-project surveys will be conducted to document existing infestations and to evaluate the effects of projects on noxious weed infestations.

Weed propagule-free equipment will be required on all vegetation management projects. Seed used for rehabilitation projects will be certified as “All-States Noxious Weed Free” by an approved testing laboratory, such as the Oregon State University Seed Lab.

Mineral material (i.e., gravel) used for reinforcement around troughs or ponds will be obtained from weed propagule-free sources.

Water for prescribed fire, watering roads, or other planned activities will be obtained from sites certified as weed free from noxious weed propagules by a Forest officer.

Monitoring

Long term effectiveness monitoring will be conducted using the ecological site plots established by the National Resource Conservation Service in 2001. A random percentage of the plots will be re-visited in 2011 and analyzed to determine ecological trends. A random percentage of Condition and Trend transects will also be re-read. Both of these methods will be used to evaluate ecological trend by measuring plant composition. If these data indicate a downward trend, management changes will be made to promote a static or upward ecological trend. Condition and Trend plots will be identified on the ground and protected before and during treatment activities. The number of plots and transects measured will depend upon annual monitoring budgets.

Monitoring of seeding/tilling/fertilizing effectiveness will be conducted using paced transects across the treated area. Transects of untreated sites will be located and measured next to treated sites as controls for comparison. Surveys will be conducted using standard Condition and Trend plot sampling procedures and will include data on species composition and percent ground cover of seeded, non-native, and invasive annual and perennial species. Other measurement parameters may be added as needed. The Grassland will welcome multi-party participation (involving all interested groups, such as the Confederated Tribes of the Warm Springs Reservation in Oregon, Central Oregon Chapter of the Native Plant Society, Redmond Chapter of the Oregon Hunters' Association, Bureau of Land Management, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and others) in the monitoring and evaluation of these seeding trials.

Annual monitoring of bitterbrush utilization will occur in the East Winter and Holmes-Williams Allotments.

Utilization monitoring in all grazed pastures in all allotments will occur annually to determine when pasture moves should occur and whether stubble height retention standards are being met.

OTHER ALTERNATIVES CONSIDERED

In addition to the selected alternative, I considered four other alternatives, which are discussed below. A more detailed discussion of these alternatives can be found in the FEIS Chapter 2, Section 2.3.

- **Alternative A - No Action**
  - This alternative would stop allowing livestock grazing on 102,938 acres of the Grassland.
    - Twenty-three allotments would be closed to grazing (Map 7 - Alternative A - No Action).
    - New allotment management plans would not be written.
    - No new grazing agreement (and associated permits) would be issued.

- The GBGA permittees would stop maintaining existing range improvements.
    - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
    - Approximately 30 road cattleguards would remain.
    - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

- **Alternative B - Current Management**

  This alterative reflects current grazing management as stated in existing allotment management plans and changed by annual operating instructions.

  - This alternative would allow livestock grazing on 23 grazing allotments totaling approximately 102,938 acres of the Crooked River National Grassland. Authorized stocking rates would be 21,714 animal unit months (AUMs, a measure of forage) of livestock grazing through the Gray Butte Grazing Association. This would be the maximum allowable stocking rate on the Grassland. Actual numbers and length of grazing would depend upon utilization standards. Utilization would be monitored using stubble height. Livestock would be moved from each pasture prior to meeting stubble height standards. No new fences would be constructed.
    - Graze 12 allotments (**Blanchard, Boyce, Cyrus, Fox/Dump, Gorge, Grizzly, Lone Pine, North, Round Butte, Peninsula, Rush, and Steer)** with versions of deferred rotation grazing systems.
    - Graze three allotments (**Holmes-Squaw Creek, Lower Desert, and Williams**) under a straight rotation grazing system.
    - Graze the **Juniper Butte Allotment** under a short duration grazing system.
    - Graze seven allotments/pastures (**Canadian Bench, Clevenger, Cotter Pond, Devine, Goldmine/Falls, Kennedy, and Weaning allotments**) under a season long (one pasture) grazing system with short grazing seasons. Season long grazing usually occurs when livestock have only one pasture to graze. The **Canadian Bench, Clevenger and Goldmine/Falls** allotments are presently vacant. They will remain available for grazing, although they do not have an active grazing permit associated with them at this time.

  - The GBGA permittees would continue to maintain existing range improvements.
    - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
    - Approximately 30 road cattleguards would remain.
    - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

- **Alternative C - Proposed Action**

  Note: The Project Design Criteria for the vegetation treatments and grazing management in Alternative C are the same as Alternative C-Modified. Therefore, they will not be reiterated.

  - Allow livestock grazing on approximately 82,923 acres (19 allotments) of the Grassland (Map 9 - Alternative C - Proposed Action). Reduce the allowed livestock stocking rate to 20,289 AUMs. Actual numbers and length of grazing would depend upon meeting grass stubble height standards.

- Graze two allotments (**Gorge and Steer**) with a form of deferred rotation grazing.
- Graze two allotments (**East Winter and Holmes-Williams**) under a straight rotation grazing system.
    - The **Holmes Pasture** in the **Holmes-Squaw Creek Allotment** would be combined with the **Williams Allotment**. The new allotment, named the **Holmes-Williams Allotment**, would have two pastures totaling 2,620 acres. This allotment is within the Metolius Deer Winter Range; therefore, the livestock would generally be off of the allotment prior to August 1st.
    - The **Squaw Creek Pasture** (5,195 acres) would remain closed to grazing (Map 9 - Alternative C - Proposed Action). Grazing will not be allowed within the **Squaw Creek Pasture** to avoid occupied bull trout habitat and essential steelhead habitat, and to prevent grazing within the proposed scenic portion of the Squaw Creek corridor.
    - Create the **East Winter Allotment** by removing the **East and West Winter Pastures** from the **Lower Desert Allotment**. This allotment would have eleven Forest Service pastures totaling approximately 1,521 acres (Map 9 - Alternative C - Proposed Action). This allotment would also be managed with mule deer winter range enhancement as an objective. Bitterbrush is a key wildlife browse species (food source) in the winter range and grazing would be managed to maintain bitterbrush leaf and leader growth for big game. Livestock use would generally not be allowed after August 1
- Divide the **Juniper Butte Allotment** into two new allotments; **Juniper Butte** to the west and **Haystack** to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line. This change is needed because Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway.
    - Graze the new **Haystack Allotment** (Juniper Butte east of Hwy 97) under a short duration grazing system (rapidly move livestock from one pasture to the next, often returning to pastures used earlier in the grazing season).
    - Graze the new **Juniper Butte Allotment** (Juniper Butte west of Hwy 97) under a deferred rotation grazing system.
- Graze ten allotments (**Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush**) with a rest rotation grazing system. This action would increase the collection and buildup of organic matter in and on the soil needed to: restore deep-rooted native bunchgrasses, increase the variety of stubble heights left following grazing, and aid the health and productivity of the existing plants.
    - Move the **Mud Springs Pasture** boundary fence in the **Fox Allotment** to more evenly spread livestock use across the landscape and reduce the amount of grazing on the Mud Springs Flat area. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).
- Graze five allotments/pastures (**Canadian Bench, Cotter Pond, Devine, Kennedy, and Weaning**) under a season long grazing system (one pasture with short grazing seasons).
- Stop allowing livestock grazing on four allotments/pastures (**Clevenger, Goldmine/Falls, and Peninsula Allotments** and the **Squaw Creek Pasture of the**

Holmes – Squaw Creek Allotment) totaling 8,233 acres of Grassland (Map 9 - Alternative C - Proposed Action).

- ❖ Two cattleguards would be removed from closed allotments using a backhoe.

- Manage two existing allotments (**Canadian Bench and Lower Desert**) as forage reserves totaling approximately 11,782 acres of the Grassland.
  - ❖ In the **Lower Desert Allotment**, approximately 15 miles of new three-wire fence line would be constructed. Approximately 10 water trough sites would be established and water would have to be hauled to water livestock when the reserves were used. This allotment would be grazed on a rest-rotation system. The forage reserves would only be used by Grassland permitted livestock while/if their assigned allotment is being rehabilitated/restored (which may require rest from grazing).
  - ❖ The **Canadian Bench Allotment** would only be grazed by domestic sheep because of the large number of private in holdings, the prohibitive costs of fencing, and the lack of surface water sources. No fences would be constructed. All water would be hauled.

- About 50,000 acres of western juniper density management and control would occur over the next 10 years using chainsaw cutting and prescribed fire.

- Eight thousand three hundred forty four acres of previously farmed sites would be rehabilitated.

Alternative D

Note: The Project Design Criteria for the vegetation treatments and grazing management in Alternative D are the same as Alternative C and Alternative C-Modified. Therefore, they will not be reiterated.

- Allow livestock grazing on approximately 88,085 acres (20 allotments) of the Grassland (Map 10 - Alternative D). Reduce the allowed livestock stocking rate to 20,983 AUMs. Actual numbers and length of grazing would depend upon meeting grass stubble height standards. Changes to grazing systems and allotment boundaries and allotment closures are the same as described earlier for Alternative C - Modified, except that in Alternative D a larger area in the **Lower Desert Allotment** would be open to livestock grazing and 15 miles of fence would be constructed.

- Remove western juniper on approximately 29,590 acres of over the next ten years (Map 10 - Alternative D) using:
  - Chainsaw felling on approximately 10,800 acres.
  - Chainsaw felling followed by low intensity prescribed fire seven plus years following felling on approximately 5,200 acres.
  - Prescribed burning on approximately 4,760 acres.
  - Shrub mowing (mechanical treatment) on approximately 490 acres.
  - Eight thousand three hundred forty four acres of previously farmed areas would be rehabilitated.

Table ROD-5 Comparison of the Alternatives

VEGETATION TREATMENTS/GRAZING DISPOSITION		ALTERNATIVES				
		A	B	C	C-Mod	D
Acres of Juniper Density Control - chainsaw		0	0	27,095	27,095	10,803
Acres of Juniper Density Control – chainsaw/prescribed fire		0	0	5,196	5,196	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire		0	0	7,510	7,510	4,757
Acres of Sagebrush/Juniper cover control - mechanical				488	488	488
Acres of Juniper Control as part of seeding treatments - chainsaw		0	0	8,344	8,344	8,344
	Total Acres of Juniper Control	0	0	48,633	48,633	29,588
	Total Acres of Till/Seed/Fertilize	0	0	8,344	8,344	8,344
	Total Acres of Vegetation Treatment	0	0	48,633	48,633	29,588
Acres Open to Domestic Livestock Grazing		0	102,938	82,923	82,923	88,085
Acres Vacant to Domestic Livestock Grazing		0	0	0	1,592	1,592
Acres Closed to Domestic Livestock Grazing		102,938	0	8,233	18,423	13,261
Acres in Forage Reserve		0	0	11,782	0	0
Total Acres		102,938	102,938	102,938	102,938	102,938

RATIONALE FOR THE DECISION

I have based my decision on a thorough review of the information disclosed in the Final Environmental Impact Statement (FEIS), the Interdisciplinary Team's specialist reports, the Grassland Land and Resource Management Plan, the Grassland Watershed Analysis, and feedback received from the public and the Confederated Tribes of the Warm Springs Reservation of Oregon about the proposed actions. In making this decision, I considered the ability of each alternative to: meet the stated purpose and need for action; comply with applicable laws, statutes, regulations, executive orders and policies; and respond to key issues and comments received on the Draft Environmental Impact Statement.

Alternative C-Modified responds to each of the purpose and need statements in the following ways:

There is a need; to reduce the density and distribution of western juniper to a more ecologically balanced mix, and to maintain existing sagebrush shrublands and grasslands.

Historically, an estimated 20 to 40 percent of the Grassland had a major component of western juniper while the rest was shrubland and grassland. Today, western juniper occupies about 90 percent of the land area. This expansion has had profound environmental effects, including the loss of native perennial grasses, shrubs, and forbs. In turn, this loss has led to a decline in the amount and quality of the shrubland and grassland habitat available to pronghorn antelope and species designated by the Forest Service as Sensitive – the gray flycatcher and the pygmy rabbit. Our goal is to return the Grassland's grass, sagebrush, and western juniper habitats to a more balanced mix. Treatment of western juniper is an essential part of reaching this goal.

Throughout the Columbia Basin the cumulative effects of fire suppression, agricultural development, urban expansion, grazing, and other activities have altered the present day mix of vegetation (species, size and age) as compared to historic conditions. Juniper-dominated areas have increased while there has been a reduction in grassland and shrubland areas. Some of the reduction is attributable to the conversion of native rangeland to agricultural fields.

Another reason for the decline is the expansion of juniper into sagebrush and grass communities. The expansion of juniper throughout Central Oregon as well as on the Grassland is well-documented through research and by photographic evidence. These pictures illustrate the changes that have occurred throughout the Grassland.

Gray Butte Early 1900s

Gray Butte 2004

This early 1900s photograph illustrates the limited amount of western juniper trees occurring on Gray Butte, which is located on the Crooked River National Grassland.	This July, 2004 photograph of the same area displays a tremendous increase of western juniper on Gray Butte.

I have decided to use; chainsaw cutting, prescribed fire, mechanical methods or a combination of the three, to limit, but not eliminate, the extent of western juniper on the Grassland over the next 10 years. Without this treatment, the extent of grassland and shrubland will decrease and juniper will occupy an increasing amount of the landscape. Alternative C would move the present vegetation mix on the Grassland closest to that which evolved under natural processes, such as wildfire. Therefore, I have incorporated the treatments in Alternative C into my selected alternative, Alternative C-Modified.

Implementation of this decision will treat 49,000 acres of juniper. Of these, 41,000 (84 percent of the treated acres) are shrublands and grasslands into which young juniper have become established but are not yet a dominant feature. Cutting the juniper in these areas will maintain this existing amount of shrubland and grassland habitat on the Grassland.

The remaining 8,000 acres to be treated contain juniper trees that are either 5 inches to 8.9 inches in diameter (pole-sized) or are 9.0 inches to 20.9 inches in diameter. Alternative C-Modified will:

- Reduce the area of pole-sized juniper trees (while increasing grassland/shrubland) by 1,146 acres in 10 years and a projected 6,052 acres in 30 years.
- Slightly reduce the area with 9.0 to 20.9 inch juniper (96 acres) in 10 years but increase by 14,645 acres in the 30 year projection following treatment.

I believe that this reduced amount of pole-sized juniper trees is not a cause for concern because of the abundance of juniper in central Oregon and its likely continued expansion throughout Central Oregon. Conversely, grasslands and shrublands have declined greatly and are a priority for preservation and management throughout the region. Also, direction in the Land and Resource Management Plan for the Grassland emphasizes the preservation of these ecosystems. Furthermore, although there would be a slight decrease in the area with 9.0 to 20.9 inch juniper trees in the short term, in 30 years about 28 percent of the Grassland is projected to have 9 inch and larger juniper trees.

Some commenters feel that we need to better understand the underlying causes of juniper expansion, particularly the influence of livestock grazing, and the effects of this expansion before conducting widespread treatments. Recent data collected from five designated/proposed Research Natural Areas in Central Oregon (including one on the Grassland) indicate that juniper expansion has accelerated regardless of the disturbance regime. These data also show that active human disturbance is not required for this expansion to occur.

Our Condition and Trend Plots show a dramatic increase in juniper encroachment during the last 50 years. To illustrate, the photo on the left was taken in 1958. In 2001, that same site was re-photographed.

Many areas on the Grassland are now ecologically out of balance because of the expansion of juniper into areas where they would normally not occur. The treatments in this decision will move conditions on the Grassland closer to an ecologically-balanced mix. The Confederated Tribes of the Warm Springs Reservation of Oregon support the treatments included in this decision because juniper expansion affects habitats for cultural plants and wildlife. Tribal members use the Grassland to gather cultural plants and to hunt.

Old Growth Juniper **-** There has been significant public support for our juniper treatment objectives. In fact, some commenters expressed the opinion that not enough juniper was being treated, and took issue with our estimates of the historic amount of juniper existing on the Grassland (they believe we over-estimate the amount of juniper present historically). In contrast, others want us to protect old growth juniper by establishing a restriction that no juniper trees would be cut that are larger than 10 inches in diameter at breast height (dbh).

Unlike many other tree species, the age of western juniper is most soundly expressed by growth form. That is, younger, actively growing western juniper trees may have greater diameters or heights than older

trees that are often found on harsh, rocky sites which limit their size. Therefore, I feel that the criteria used in this decision –growth form—will result in better protection of old growth trees than a diameter limit.

At least three independent studies have been conducted which give us information about the age of juniper trees on the Grassland:

- One study measured the age of trees in two undisturbed Research Natural Areas, one of which is located on the Grassland (the Island Research Natural Area). In the Island Research Natural Area, more than 60 percent of the trees were established since 1978, and 81 percent were juvenile trees.
- Another study measured trees in five matched pairs of study sites in central Oregon; one of the paired sites was located on the Grassland in the Haystack Butte Research Natural Area. The Haystack Butte study site was divided by the researchers into representative "undisturbed" and "disturbed" areas. The undisturbed site is located on steep, very rocky slopes with sparse cover and no evidence of widespread fire. This site is representative of where we expect older juniper to occur – on or near ridge tops – and they do. The mean age of the sampled trees in the undisturbed area was 211 years old. In the disturbed area, which has much gentler slopes (and occurs down slope of the undisturbed site) the mean age of the sampled trees was 30 years. The disturbed area had been affected by past homesteading and other management activities.
- In the third study, trees were sampled from two sites on the Grassland (Gray Butte/Pine Ridge and Round Butte). None of the trees in the plots were classified as "old". Although a few individuals were established between 1850 and 1935, the vast majority were established between 1945 and 1970.

Designated old growth juniper is a Land and Resource Management Plan management area allocation. There are 15 designated old growth juniper management areas spread across the Grassland. However, these areas may not contain biological old growth. At the time the plan was developed, these areas were selected for their ability to support old growth in the future. Several commenters recommended that the official old growth designated areas be modified to better reflect areas where old trees should occur (such as rocky areas and ridge tops). Because changing these designations requires an amendment to the Land and Resource Management Plan for the Grassland, it is outside the scope of this project. A revision of the Grassland plan will begin in 2007 and these designations will be revisited in that planning effort. In the interim, no treatment will occur in the 15 designated old growth areas and all trees exhibiting old growth characteristics, which are located within treatment areas, will be retained.

Other Benefits - Habitat for wildlife species that are strongly linked with grasses and shrubs (such as pronghorn antelope, horned lark, California and mountain quail, Belding's ground squirrel and two Forest Service Sensitive species, the gray flycatcher and pygmy rabbit) has declined on the Grassland. The juniper treatments in Alternative C - Modified will increase the amount of habitat and/or forage available to these and a variety of other wildlife species. These habitat benefits would not occur under Alternatives A and B, and there would be less benefit under Alternative D. Therefore, to promote and preserve grassland and sagebrush habitats on the Grassland, I have decided to incorporate the vegetation management actions from Alternative C into this decision.

Juniper expansion can also cause undesirable watershed effects. For example, juniper can use soil moisture very early in the spring, before other plants begin to grow. On a warm April day, individual trees can use up to 20 gallons of water per day. In addition, in Central Oregon studies have shown that up to 20 percent of the annual precipitation may be intercepted by juniper trees before it can reach the grasses and shrubs underneath them. Over time, this competition for water can crowd out the grasses and shrubs and increase the amount of

bare soil. Studies conducted on the Grassland have demonstrated that the perennial grass cover can be increased by juniper treatment. By reducing competition from junipers for soil moisture, grasses and shrubs become healthier, which in turn promotes watershed health.

Prescribed Fire - One of the DEIS commenters suggests we use only prescribed fire to treat juniper (no chainsaw felling). There are many instances where the use of prescribed fire would not be ecologically appropriate. These include: when an undesirable species, such as cheatgrass, would be favored by fire; when retention of shrubs is desired; when fuel loadings would result in scorching and sterilization of the soil; or when high fuel loadings would result in unmanageable fire behavior. Because of these risks, I have decided to conduct a majority of the juniper thinning through a combination of chainsaw felling and pile burning, as well as some prescribed burning.

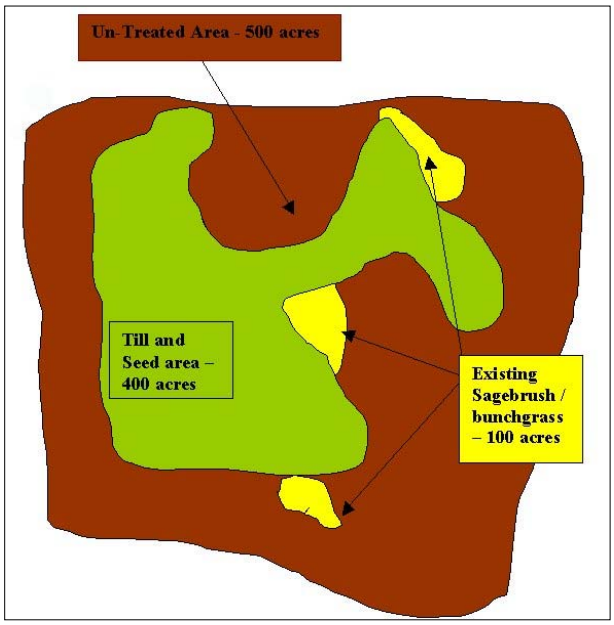
There is a need to restore bunchgrasses and accelerate recovery of previously farmed and heavily disturbed sites.

About one half of the Grassland was dryland farmed by homesteaders for about 40 years during the late 1800's and early 1900's. These lands were then subjected to drought and erosion during the 1920's and 1930's. Between 1935 and 1965 most of these farmed areas were seeded to non-native plant species such as crested wheatgrass.

This decision will restore a portion (8,344 acres) of these previously farmed and disturbed sites in the next 10 years. Only about 4,200 acres of the 8,344 will actually be treated, because one half (50 percent) of each treatment unit will be left undisturbed. The 4,200 treated acres represents less than four percent of the entire Grassland area.

Figure ROD-1, below, provides an example of how a theoretical 1000-acre area will be treated. Note that existing sagebrush/bunchgrass areas will be left untreated as seed sources, and the seeded area will be irregular in shape to provide a diversity of habitats. Fifty percent of each unit will be untreated.

Figure ROD-1 Example of a Seeding Treatment



A range of ecological conditions now exists on historically homesteaded and farmed sites. Some have moved from a monoculture of crested wheatgrass toward a more natural mix of native plants such sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Sandberg's bluegrass, and forbs.

Other sites exhibit slow or no ecological progression. Rabbitbrush, crested wheatgrass, and Sandberg's bluegrass (a shallow-rooted short native grass) continue to dominate these areas. Bunchgrasses occur on these sites much less frequently than in areas with less alteration. When Sandberg's bluegrass increases, colonization of the area by bunchgrasses becomes more difficult. Without intervention on these sites, the progression of these sites to a mixture of shrubs, bunchgrasses,

and forbs will be quite slow. Because Sandberg's bluegrass cures and dries out earlier than other grass species, it is a less desirable source of forage for pronghorn. Because its leaves generally grow to no more than two inches in height, Sandberg's bluegrass also provides less structural diversity than deep-rooted perennial bunchgrasses. Structure is a feature important to ground nesting birds. Therefore, to accelerate restoration of these areas to a balanced and healthy mix of bunchgrasses and shrubs, I have decided to reseed a portion of them.

To respond to concerns about the potential effects of tilling and fertilizing which occur as part of the seeding process, I have decided to begin the rehabilitation of these areas using a series of trials. These trials will be used by the Grassland and its partners to evaluate the success of various site preparation techniques (such as tilling versus interseeding), seed mixtures, and fertilizer formulations. Trial size will generally be a minimum of 10 acres. The trials will be assessed three years following treatment to evaluate results, including the establishment and survival of the seeded species and the cost-effectiveness of the treatments. If a particular combination of treatments does not meet objectives (i.e., does not provide the desired results) the methods will be modified and re-tested.

The Grassland will welcome multi-party participation (involving all interested groups, such as the Confederated Tribes of the Warm Springs Reservation in Oregon, Central Oregon Chapter of the Native Plant Society, Redmond Chapter of the Oregon Hunters' Association, Bureau of Land Management, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and others) in the monitoring and evaluation of these seeding trials.

To respond to concerns of members of the Confederated Tribes of the Warm Springs Reservation in Oregon, my decision includes measures to protect cultural plants. Specifically, pre-disturbance surveys of high-probability habitat for cultural plants will be conducted on 20 percent of the areas to be seeded. In addition, when cultural plant populations/habitats are encountered during vegetation management project planning, layout or execution they will be protected. Consultation with the Tribes will occur on an ongoing basis to ensure that all cultural values are being protected during implementation of this decision.

Natives versus Cultivars - Some commenters oppose the use of grass cultivars that were developed from genetic sources in other states or ecoregions. Forest Service policy is to use local native species for re-vegetation projects, if conditions are suitable for native species and seed is available. Cultivated varieties may otherwise be used. Loss of topsoil from decades of farming and the introduction of cheatgrass may have created conditions where, on some sites, native species may be more difficult to establish than cultivars of native grasses. Cultivars have been shown to be adapted to disturbed sites and to compete well with invasive plants. However, if the trials indicate native species can be successfully established, they will be preferred.

However, seed cost must be considered. The Grassland has completed seed collections of native grasses and forbs, and has contracted for production of two native grass species. The current contract price for locally collected, native bottlebrush squirreltail is $24/lb, whereas the cultivar, big bluegrass, is currently available for $1.15/lb. At present prices, this translates into seed costs of $30-$50/acre for a native/cultivar mix, and $70-$100/acre for a pure native seed mix.

To address this concern about the use of cultivars instead of natives, I have decided that a minimum of 5 of the trial plots will be seeded with a 100 percent native seed mix within the first five years of implementation. As a goal, at least 10 percent of the 8,344 total treatment acres would be seeded with a 100 percent native seed mix unless the results of the trials show that a 100 percent native seed mix cannot be successfully used or it is cost-prohibitive. On the remaining 7,344 acres a mixture of natives and desirable non-natives will be used. My preference is to use a native seed mix whenever it is practical to do so. However, when treating especially degraded sites (such as those dominated by medusahead),

desirable non-native species comprised of cultivars and exotics will be given priority. No unit will be seeded 100 percent to non-native species and the native seed mixtures will include locally-collected native seed that is increased by a contracted grower and/or source-identified local seed that is locally collected from a broader area and produced for commercial sale by growers.

Alternatives A and B do not include actions to rehabilitate previously farmed sites. Alternatives C and D both propose the same set of actions to restore some of these degraded areas. I believe that there will be more benefits to wildlife habitat and watershed health by restoring bunchgrasses on these sites than if they are left untreated. I also feel that, if no reseeding occurs, an opportunity will be lost to fulfill the demonstrational purposes for which the national grasslands were established. Therefore, I have decided to implement the restoration actions in Alternative C (which are the same as those described in Alternative D).

There is a social/economic need to continue livestock grazing on the Crooked River National Grassland.

As discussed under the Purpose and Need for Action, there are social and economic benefits associated with livestock grazing on the Grassland. Of the estimated 11,000 cattle in Jefferson County, about 23% (2,500) graze on the Grassland. The Grassland provides forage for these cattle for four to seven months annually. There is also an economic demand for the forage produced on the Grassland. This demand is demonstrated by the annual stocking of most grazing allotments on the Grassland over the past fifty years.

Alternative A (elimination of all livestock grazing on the Grassland) would not meet this purpose and need, and would not meet the intent of the Bankhead-Jones Farm Tenant Act, the 213 Regulations, or Forest Service Manual 2200. The Gray Butte Grazing Association supports the livestock grazing management changes included in Alternative C - Modified, including the closure of several allotments. The grazing management actions in Alternative B do not result in any changes to existing livestock grazing management from the existing situation, and therefore does not meet the purpose and need. Alternative B does not close any allotments, institute rest rotation grazing systems where they are needed, or make other adjustments such as combining allotments, splitting allotments, or realigning the Mud Springs Pasture fence. I believe that, by adopting the livestock grazing practices in Alternative D, this decision strikes an appropriate balance between promoting ecological health and allowing the Grassland to serve as a working landscape through its multiple use mandate (Alternative C).

Suitability for Livestock Grazing - The Grassland Land and Resource Management Plan and Forest Service policy allow livestock grazing on suitable land. The capability and suitability for grazing on the Grassland were assessed in the Final Environmental Impact Statement using two methods: by re-reading Condition and Trend Cluster Transects and through a Rangeland Inventory conducted by the Natural Resources Conservation Service (NRCS) in 2001. Three of the Condition and Trend Cluster transects out of 31, or 9 percent, showed a trend away from the potential natural plant community. In the NRCS survey, 40 percent of the indicators showed a trend toward Historic Climax Plant Community (HCPC), 52 percent were static or indicated no apparent trend, and eight percent indicated movement away from HCPC (HCPC is what the vegetation mix would be on a site without any human-caused disturbance). Therefore, under both methods about 90 percent of the measured sites indicated stable or positive ecological trends. The two photos on the next page illustrate the condition of two native (not seeded) rangeland sites that have been grazed for decades.

This photograph was taken on June 27, 2001 in the Middle Pasture of the Blanchard Allotment. Livestock were in this pasture until May 15, 2001. The Similarity Index for this site is 96, which means that it is almost identical to the expected Historic Climax Plant Community.	This photograph was taken on June 13, 2001 in the McCoin Pasture of the Lone Pine Allotment. Livestock were in this pasture until May 21, 2001. The Similarity Index for this site is 77, which means that it is very similar to the expected Historic Climax Plant Community (although juniper densities are much higher than historic).

The Condition and Trend Cluster Transects and the Rangeland Inventory studies demonstrate that most of the 23 grazing allotments on the Grassland are suitable for livestock grazing. Where ecological trends are downward, in all cases the causative factors are addressed through actions included in this decision. Specifically, where livestock grazing has been identified as a causative factor the allotment will be closed (Peninsula Allotment) or the grazing system will be changed. Overall, under this decision a significant portion of the Grassland – approximately 18 percent -- will not be grazed. More than 90 percent of the riparian areas have already been fenced to exclude livestock, and sensitive areas such as, the Middle Deschutes and Lower Crooked Wild and Scenic Rivers, and the proposed scenic portion of Squaw Creek, will not be grazed.

Whether livestock should be grazed on public lands is a strongly debated issue among some sectors of the public. Although only about 23 percent of the available forage on the portions of Grassland open to grazing is allocated to livestock, some commenters assert that too much forage is allocated for livestock use. Other commenters believe that national grasslands should be managed as an ecological preserve. Title 36 of the Code of Federal Regulations, § 213.1, states that the National Grasslands "shall be administered under sound and progressive principles of land conservation and multiple use, and to promote development of grassland agriculture and sustained-yield management of the forage, fish and wildlife, timber, water and recreational resources in the areas of which the National Grasslands are a part." Forest Service Manual 2200, Grazing Management, states that the national grasslands are to be managed to "promote the development of grassland agriculture and sustained yield management of the soil, water, forage, fish and wildlife, recreation, and timber resources" and "to demonstrate sound and practical principles of land use to favorably influence nearby areas and economies". Therefore, I have decided that livestock grazing will continue to be one of the multiple uses that occur on the Grassland.

From 1990 to 2000 the population of Jefferson County grew 39 percent. In nearby Deschutes and Crook Counties, growth was 54 percent and 36 percent, respectively. Deschutes County is one of the fastest growing counties in the Pacific Northwest. In fact, from 2000 to 2003, Deschutes County grew by an

additional 12.2 percent. With its location in the triangle formed by Redmond, Madras, and Prineville, the Grassland is surrounded by rapidly growing communities.

Between 1975 and 2001, the amount of wildland range in eastern Oregon decreased by 2 percent because of development. During that same period, in the vicinity of Bend, Oregon the area of low-density residential uses increased by 86 percent and the extent of urban area increased by 137 percent. When forests and grasslands are subdivided into smaller, more isolated patches of developed land, open space is lost. I believe that protecting rangelands as open space is important. Well-managed forests and grasslands, private and public, can protect watersheds far better than even the most careful urban or suburban development. They also provide crucial wildlife habitat. Unfortunately, from 1988 to 1999, the number of ranchers who lease, or hold permits to use, lands managed by the Forest Service and BLM dropped by 20 percent. In this rapidly developing region, I want to preserve open space by helping ranching families stay on the land.

There is a need to leave a diversity of grass stubble heights at the end of the grazing season. A range of stubble heights would provide habitat for ground nesting birds such as the California quail, western meadowlark, horned lark, and the burrowing owl. Also, some of the historically homesteaded and farmed sites lack organic matter in and on the soil.

I have decided to add rest pastures to certain allotments to help accumulate organic matter on the soil surface and enhance seed production, which, in turn, will promote the health and establishment of deep-rooted native perennial plants. Adding rest pastures will also increase the diversity of stubble height left at the end of the grazing season and provide better hiding and nesting cover for birds and small mammals. Finally, adding a rest pasture will increase forage production because individual plants would be allowed to build reserves in their root system and gain vigor. Establishment of rest pastures is included in Alternative C, Alternative C-Modified and Alternative D, but not Alternative B. Under Alternative C-Modified, 88 percent of the grazed acres on the Grassland will be managed under a rest rotation system.

One commenter expressed the opinion that changes in management are not needed because the trend is upward in most of the allotments and there would be a loss of annual available forage. Adding a rest pasture in the ten allotments will result in a 10 percent reduction from current levels in the number of animal unit months utilized by the permittees. This reduction could be offset over time by increases in productivity because plants will be getting periodic rest and because of reductions in the extent of juniper which compete with forage plants for water and nutrients. This reduction is an estimate of how much less forage might be eaten by livestock because one pasture will be rested each year. However, the authorized numbers on these allotments will not be decreased from current levels. This situation can exist because only about 23 percent of the available forage on the Grassland (areas open to livestock grazing) is allocated to livestock grazing; the remainder is left for wildlife or is unused.

Stubble height standards are now and will continue to be used to determine when grazing should cease on a pasture, regardless of the grazing system. The length of the grazing season and livestock numbers in all allotments will continue to depend on yearly growing conditions and each permittee's management of his/her livestock, as measured by utilization. All comments received from the Gray Butte Grazing Association permittees, including the President of the Association, support adding rest pastures to these allotments. Adding rest pastures is an element of Alternatives C and D but not Alternatives A or B.

In allotments managed under a rest rotation grazing system where crested wheatgrass is the key plant species, palatability is a concern. Light use or nonuse for long periods in crested wheatgrass seedings can

diminish green forage values for wildlife because grass plants become unpalatable. Periodic moderate grazing makes fall green-up (i.e., the new vegetative growth initiated by growing season soil moisture) available to big game or other wildlife species. Green-up is valuable to wildlife because it provides succulent, nutritious, and easily digested forage. Many species of wildlife, from songbirds to big game, at times will make use of green-up; its value for wildlife is highest within habitats used during fall, winter, and early spring. Where green-up is available on winter ranges, it helps animals to maintain their physical condition and therefore can be directly tied to winter and early spring survival. I have decided that a small portion (2 pastures out of 80, or 2 percent) may be grazed in a manner which stimulates green-up. Because ungrazed or lightly grazed areas provide high quality cover, structure and forage for wildlife, I have also decided that all allotments with a rest rotation system will have one pasture rested each year.

There is a need to close livestock grazing on three allotments and one pasture of another allotment.

I have decided to close the Peninsula Allotment because of: downward ecological trends, the fact that all range improvements are in disrepair, and the allotment is located in an area of increasing residential growth with no fences separating the private land from the Grassland.

I have also decided to close the Clevenger, and Goldmine/Falls Allotments, the Squaw Creek Pasture of the Holmes-Squaw Creek Allotment and the Geneva, Airstrip and Dry Lake Pastures in the Lower Desert Allotment.

The Clevenger and Goldmine/Falls allotments have been vacant for more than ten years and there is no demand for either one. To graze them would require extensive fence construction and the development of watering facilities. In addition, both allotments are partially within the boundaries of the Middle Deschutes Wild and Scenic River corridor.

The Squaw Creek pasture contains a section of Squaw Creek and is located in the Squaw Creek Management Area. Because the Grassland Land and Resource Management Plan, as amended, directs that livestock grazing will not occur in the river corridor, I have decided not to graze this pasture.

Finally, I am closing the Geneva, Airstrip, and Dry Lake Pastures of the Lower Desert Allotment. Because private land ownership in the allotment has changed, grazing the private lands in these areas in conjunction with the Grassland is not feasible. In addition, maintenance of the fences and gates has been troublesome for the permittee because of repeated damage to these structures. To graze the Dry Lake pasture would require construction of about 15 miles of fence and the installation of watering facilities. Because demand has not been consistent, the Gray Butte Grazing Association and the Grassland have agreed to close this allotment. In total, more than 18,400 acres now open for grazing on the Grassland will be closed.

Several commenters opposed the establishment and use of forage reserves on the Grassland. Conflicts with proposed Oregon Department of Fish and Wildlife California bighorn sheep transplants to the Deschutes River Canyon were cited and some local residents living within the allotments are concerned about domestic sheep grazing practices and weed introduction. In response, I have decided that no forage reserves will be established. The Canadian Bench Allotment will remain vacant and only 1,521 acres (new East Winter Allotment) in the Lower Desert Allotment will be open for grazing. Grazing in the Canadian Bench Allotment will occur only to meet resource objectives (such as fine fuels reduction or wildlife forage enhancement) that are mutually agreed to by the Grassland and the primary private

landowners in the allotment -- the Portland General Electric Company and the Confederated Tribes of the Warm Springs Reservation of Oregon.

Other Issues Raised by Commenters and the Interdisciplinary Team

- ***Effects to Water Quality and Quantity*** **-** Project design criteria have been incorporated into this decision to respond to this concern. For example, INFISH buffers will be maintained between reseeding treatments and streams. In addition, all vegetation management activities in this decision which occur in or adjacent to designated Riparian Habitat Conservation Areas will follow the Project Design Criteria in the Programmatic Biological Opinion. Finally, more than 90 percent of the riparian areas on the Grassland have been fenced to exclude livestock (including nearly all perennial streams such as, Squaw Creek, Willow Creek, Crooked River, and Deschutes River). The FEIS effects analysis shows that, although the risk is highest under alternative C for short-term erosion and sedimentation, no measurable effects are expected to occur under any of the alternatives. In addition, the actions in this decision would not cause any measurable increase in the temperature of streams that currently do not meet temperature criteria [303(d)-listed streams].

- ***Mule Deer and Pronghorn Winter Range Effects and Effects to Future Bighorn Sheep Reintroduction*** **-** The vegetation treatments in Alternative C, combined with the changes in livestock grazing management included in Alternative D, will result in the greatest benefit to pronghorn and mule deer of the alternatives analyzed in the FEIS. Therefore, I have incorporated them into the selected alternative, Alternative C - Modified. To respond to concerns about the potential effect of the forage reserves on the future reintroduction of bighorn sheep to the area, I have decided not to create them and they are not included in Alternative C-Modified.

  The grazed portion of the Lower Desert Allotment (1,521 acres making the new East Winter Allotment), as well as the Holmes-Williams Allotment, will be managed to maintain and/or enhance the quality of mule deer winter range forage. Mule deer winter range requirements and needs will have priority over the provision of forage for domestic livestock. To respond to concerns about potential utilization of bitterbrush by livestock, I have decided to limit the general season of use for domestic livestock within Metolius Mule Deer Winter Range to prior to August 1. Climatic conditions could require earlier removal of livestock at the direction of a Forest officer. Climatic conditions could also allow an extension of season after August 1 following a written request and District Ranger approval. In addition, because bitterbrush is a key browse species on the winter range, I am requiring annual monitoring of livestock use of bitterbrush to ensure that sufficient bitterbrush leaf and leader growth is left following livestock grazing.

- ***Effects to Visual Resources*** **-** Project design criteria have been incorporated into this decision to preserve the assigned visual quality objectives for each area. I believe that this issue has been sufficiently addressed and mitigated.

- ***Risk of Noxious Weed Establishment*** **-** The risk factor assessment in the FEIS indicates that all the alternatives, including the No Action Alternative, have a high risk of introducing and establishing noxious weeds. This high risk is due to the other activities occurring on the Grassland that will continue for the foreseeable future regardless of which alternative is implemented. Specifically, vehicle traffic on roads, road maintenance, power line maintenance, and mineral material source use have been, and will continue to be, major causes for noxious weed infestations. Appendix I outlines the noxious weed prevention measures included in this

decision. All but two of these measures are considered highly efficacious in the prevention of noxious weed spread (the remaining two are rated "medium" for efficacy). The vegetation and grazing management actions in this decision are designed to promote grassland/shrubland health and improve organic matter retention on the soil surface. This, in turn, will help prevent noxious weeds from becoming established. In addition, because juniper expansion into grassland and shrubland often leads to losses in soil surface cover, Alternative C - Modified will provide the most preventative benefit by promoting grass and shrub health.

The following two tables summarize how all the alternatives relate to the Purpose and Need for Action and the Key Issues.

Table ROD-6 How the Alternatives Compare Relative to the Purpose and Need for Action

Purpose and Need	Alternative A	Alternative B	Alternative C	Alternative C-Modified	Alternative D
There is a need to reduce the density and distribution of western juniper to a more ecologically balanced mix.	No juniper would be treated. Does not address need	No juniper would be treated. Does not address need	48,633 acres would be treated. Best addresses need.	48,633 acres would be treated. Best addresses need.	29,588 acres would be treated. Addresses need.
There is a need to restore bunchgrasses and accelerate recovery of previously farmed and heavily disturbed sites.	No reseeding would occur. Does not address need	No reseeding would occur. Does not address need	8,344 acres would be treated. Addresses need.	8,344 acres would be treated. Addresses need.	8,344 acres would be treated. Addresses need.
There is a social/economic need to continue livestock grazing on the Crooked River National Grassland.	No livestock grazing would occur on the Grassland. Does not address need	21,714 animal unit months would be authorized. Best addresses need.	20,289 animal unit months would be authorized. Addresses need.	20,621 animal unit months would be authorized. Addresses need.	20,983 animal unit months would be authorized. Addresses need.
There is a need to leave a diversity of grass stubble heights at the end of the grazing season to provide habitat for ground nesting birds and help accumulate organic matter on the soil.	No livestock grazing would occur on the Grassland. Addresses need.	No rest pastures would be added to any allotments. Does not address need.	Adds a rest pasture to ten allotments. Addresses need.	Adds a rest pasture to ten allotments. Addresses need.	Adds a rest pasture to ten allotments. Addresses need.
There is a need to close livestock grazing on three allotments and one pasture of another allotment.	All allotments (102,938 acres) would be closed. Addresses need.	No allotments would be closed. Does not address need.	Four allotments/pastures (8,233 acres) would be closed. Addresses need.	Part or all of five allotments/pastures (18,400 acres) would be closed. Addresses need.	Part or all of five allotments/pastures (13,261 acres) would be closed. Addresses need.

Table ROD-7 How the Alternatives Compare Relative to the Key Issues

Key Issue	Alternative A	Alternative B	Alternative C	Alternative C-Modified	Alternative D
If not managed properly, livestock use can cause downward ecological trends.	Livestock grazing would have no impact on ecological trends because it is not included under this alternative. In the absence of juniper treatment and seeding the ecological trend may be downward in some areas where increasing juniper density results in the decrease of mid-sized shrubs and native perennial grasses.	Condition/trend analysis indicates that livestock grazing under current management would continue to result in static and upward trends on all allotments except (possibly) the Peninsula Allotment. No allotments would be closed. In the absence of juniper treatment and seeding the ecological trend may be downward in some areas where increasing juniper density results in the decrease of mid-sized shrubs and native perennial grasses.	This alternative prescribes more conservative grazing management than Alternative B because rest is added to ten allotments. Trends are expected to remain upward and/or static on all open allotments. 8,233 acres would be closed to grazing and 11,782 acres would be included in a forage reserve. These areas are expected to exhibit upward ecological trends.	This alternative prescribes more conservative grazing management than Alternative B because rest is added to ten allotments. Trends are expected to remain upward and/or static on all open allotments. 18,423 acres would be closed to grazing. These areas are expected to exhibit upward ecological trends.	This alternative prescribes more conservative grazing management than Alternative B because rest is added to ten allotments. Trends are expected to remain upward and/or static on all open allotments. 13,261 acres would be closed to grazing. These areas are expected to exhibit upward ecological trends.
Soil-disturbing activities such as tillage, prescribed fire, mechanical juniper removal, and grazing have the potential to increase the amount and distribution of noxious weeds and invasive plants.	Noxious weed risk rating is HIGH due to other activities on the Grassland that will continue in the foreseeable future regardless of which alternative is implemented.	Noxious weed risk rating is HIGH due to other activities on the Grassland that will continue in the foreseeable future regardless of which alternative is implemented.	Noxious weed risk rating is HIGH due to other activities on the Grassland that will continue in the foreseeable future regardless of which alternative is implemented.	Noxious weed risk rating is HIGH due to other activities on the Grassland that will continue in the foreseeable future regardless of which alternative is implemented.	Noxious weed risk rating is HIGH due to other activities on the Grassland that will continue in the foreseeable future regardless of which alternative is implemented.
Management activities such as tillage, prescribed fire, juniper control and grazing have the potential to affect water quality and quantity by changing upland and riparian vegetative cover and complexity.	No treatments or grazing proposed. Existing watershed conditions would persist and, in some cases, bare soil extent could increase as juniper out-competes grasses and shrubs.	More than 90 percent of the riparian areas on the Grassland are fenced to exclude livestock grazing. No vegetation treatments are proposed. Existing watershed conditions would persist and, in some cases, bare soil extent could increase as juniper out-competes grasses and shrubs.	More than 90 percent of the riparian areas on the Grassland are fenced to exclude livestock grazing. No treatment buffers next to streams are expected to prevent any measurable impacts to water quality. Vegetation treatments would increase the amount of perennial grass and shrub cover, which has positive effects on watershed health.	More than 90 percent of the riparian areas on the Grassland are fenced to exclude livestock grazing. No treatment buffers next to streams are expected to prevent any measurable impacts to water quality. Vegetation treatments would increase the amount of perennial grass and shrub cover, which has positive effects on watershed health.	More than 90 percent of the riparian areas on the Grassland are fenced to exclude livestock grazing. No treatment buffers next to streams are expected to prevent any measurable impacts to water quality. Vegetation treatments would increase the amount of perennial grass and shrub cover, which has positive effects on watershed health.

Key Issue	Alternative A	Alternative B	Alternative C	Alternative C-Modified	Alternative D
Management activities such as grazing, tillage/seeding/fertilization, prescribed fire, and juniper control may affect the quality, quantity and distribution of wildlife habitat, specifically designated mule deer and pronghorn winter range.	**Pronghorn** Existing habitat is deficient compared to estimated historic levels. This alternative would not improve habitat for pronghorn. Because this alternative would not implement any vegetation treatments, the amount of habitat will decrease. In 10 years, habitat is expected to decline from existing levels by 11,059 acres. **Mule Deer** The effects on mule deer habitat are similar to those for pronghorn. Existing habitat is currently deficient, and would decline by an additional 11,059 acres in 10 years. After 30 years, under this alternative habitat would still be deficient by 18,106 acres.	**Pronghorn** Existing habitat is deficient compared to estimated historic levels. This alternative would not improve habitat for pronghorn. Because this alternative would not implement any vegetation treatments, the amount of habitat will decrease. In 10 years, habitat is expected to decline from existing levels by 11,059 acres. **Mule Deer** The effects on mule deer habitat are similar to those for pronghorn. Existing habitat is currently deficient, and would decline by an additional 11,059 acres in 10 years. After 30 years, under this alternative habitat would still be deficient by 18,106 acres.	**Pronghorn** Existing habitat is deficient compared to estimated historic levels. Seeding would improve habitat for pronghorn in the treated areas. In 10 years, habitat is expected to decline from existing levels by 2,869 acres. The vegetation treatments in this alternative result in less loss of habitat than other alternatives. **Mule Deer** The effects on mule deer habitat are similar to those for pronghorn. Existing habitat is currently deficient, and would decline by 12,402 acres in 10 years. However, after 30 years habitat conditions would be deficient by about 3,345 acres. The vegetation treatments in this alternative result in less loss of habitat over the long term than other alternatives.	**Pronghorn** Existing habitat is deficient compared to estimated historic levels. Seeding would improve habitat for pronghorn in the treated areas. In 10 years, habitat is expected to decline from existing levels by 2,869 acres. The vegetation treatments in this alternative result in less loss of habitat than other alternatives. **Mule Deer** The effects on mule deer habitat are similar to those for pronghorn. Existing habitat is currently deficient, and would decline by 12,402 acres in 10 years. However, after 30 years habitat conditions would be deficient by about 3,345 acres. The vegetation treatments in this alternative result in less loss of habitat over the long term than other alternatives.	**Pronghorn** Existing habitat is deficient compared to estimated historic levels. Seeding would improve habitat for pronghorn in the treated areas. In 10 years, habitat is expected to decline from existing levels by 5,895 acres. **Mule Deer** The effects on mule deer habitat are similar to those for pronghorn. Existing habitat is currently deficient, and would decline by an additional 12,966 acres in 10 years. After 30 years, under this alternative habitat would be deficient by 8,929 acres.
Manipulation of western juniper can affect visual qualities, old growth juniper trees and wildlife habitat diversity.	No short term impacts to visual qualities would occur, but long term the open panoramic nature of the Grassland will be altered. No old growth juniper trees would be cut. No short term impacts to existing habitat, but a continued loss of shrubland and grassland habitats.	No short term impacts to visual qualities, but long term the open panoramic nature of the Grassland will be altered. No old growth juniper trees would be cut. No short term impacts to existing habitat, but a continued loss of shrubland and grassland habitats.	Short term impacts to visual qualities would occur, but long term the open panoramic nature of the Grassland would be retained. Visual Quality Objectives would be met. No old growth juniper trees would be cut. In the short term grassland and shrubland habitats will recover, and the distribution of habitats on the Grassland would improve. In the short and long term, habitat diversity would be increased.	Short term impacts to visual qualities would occur, but long term the open panoramic nature of the Grassland would be retained. Visual Quality Objectives would be met. No old growth juniper trees would be cut. In the short term grassland and shrubland habitats will recover, and the distribution of habitats on the Grassland would improve. In the short and long term, habitat diversity would be increased.	Short term impacts to visual qualities would occur, but long term the open panoramic nature of the Grassland would be retained. Visual Quality Objectives would be met. No old growth juniper trees would be cut. In the short term grassland and shrubland habitats will recover, and the distribution of habitats on the Grassland would improve. In the short and long term, habitat diversity would be increased.

Key Issue	Alternative A	Alternative B	Alternative C	Alternative C-Modified	Alternative D
Grazing domestic sheep in potential bighorn sheep habitat increases the risk of transmitting disease if bighorn sheep are re-introduced to their historic habitat on the Grassland.	No domestic sheep grazing would occur.	Sheep grazing would be allowed on the Canadian Bench Allotment. There would be a risk of transmitting disease to bighorn sheep should they be reintroduced to their historic habitat on the Grassland.	Sheep grazing would be allowed on the Canadian Bench Allotment. There would be a risk of transmitting disease to bighorn sheep should they be reintroduced to their historic habitat on the Grassland.	No domestic sheep grazing would occur.	No domestic sheep grazing would occur.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

In this Record of Decision, I have described Alternative C - Modified and have given my rationale for its selection. It is required by law that one or more environmentally preferable alternatives also be disclosed. The environmentally preferable alternative is not necessarily the alternative that will be implemented, and it does not have to meet the underlying need for the project. It does, however, have to cause the least damage to the biological and physical environment and best protect, preserve, and enhance historical, cultural, and natural resources [40 CFR 1505.2(b)].

For this Crooked River National Grassland Vegetation Management / Grazing EIS, I have determined that the selected alternative, Alternative C - Modified, is the environmentally preferable alternative. This alternative moves vegetative conditions on the Grassland closer to an ecologically balanced mix and preserves and enhances grassland and shrubland habitats for a variety of sagebrush steppe-dependent wildlife species. The project design criteria incorporated into this decision will minimize the risk of causing any significant harm to the human environment.

FINDINGS REQUIRED BY OTHER LAWS AND REGULATIONS

In reviewing the Final Supplemental Environmental Impact Statement and actions involved in Alternative C - Modified, I have concluded that my decision is consistent with the following laws, requirements, and current or proposed policies:

The National Forest Management Act

I have reviewed the management requirements and I find that Alternative C - Modified is consistent with the seven management requirements listed in 36 CFR 219.27 for protecting resources. All proposed activities utilize Grassland Plan Standards and Guidelines and incorporate design criteria that provide for resource protection.

The Crooked River National Grassland Land and Resource Management Plan (LRMP), as amended, provided the framework for the development of all the alternatives. I believe Alternative C - Modified is consistent with long term management objectives as discussed in the LRMP. I also reviewed the Crooked River National Grassland Watershed Analysis and this decision incorporates many of its recommendations.

The National Historic Preservation Act

Alternative C - Modified is consistent with all three policy elements of the Act (identify cultural resources; determine effects of the proposed actions; and consult with Tribes). There will be No Adverse Effect on cultural resources. Surveys will identify new sites and projects will be designed to avoid eligible or potentially eligible sites.

The Oregon State Historic Preservation Officer (SHPO) was consulted and a treatment plan dated December 18, 2003 was submitted to the SHPO in support of the Finding of No Adverse Effect for this project. No response from the SHPO was received. This treatment plan (see analysis file maintained at

the Madras office) outlines the mitigation measures to be taken and the areas to be surveyed when treatments occur and is incorporated into this decision.

Endangered Species Act

A Biological Assessment (BA) was prepared to document possible effects of the alternatives on endangered and threatened fish and wildlife species on the Crooked River National Grassland. Potential effects to bull trout, Mid-Columbia steelhead, and Canada lynx were assessed (FEIS, Appendix J). The BA concluded that there would be No Effect to Mid-Columbia steelhead, or Canada lynx. All of the alternatives, including Alternative C - Modified, are Not Likely to Adversely Affect bull trout and northern bald eagle. Consultation has been completed.

There are no known federally listed threatened or endangered plant species within the project area. None of the alternatives will contribute to a trend towards federal listing or cause a loss of viability to the population of any sensitive species.

Clean Air Act

Alternative C - Modified will meet the National Ambient Air Quality standards through avoidance of practices that degrade air quality below health and visibility standards. The Oregon State Implementation Plan and the Oregon State Smoke Management Plan will be followed to maintain air quality.

Clean Water Act

Alternative C - Modified will meet and conform to the Clean Water Act as amended in 1982. This act establishes a non-degradation policy for all federally proposed projects. This alternative also meets anti-degradation standards agreed to by the State of Oregon and the Forest Service, Region 6, in a Memorandum of Understanding (Forest Service Manual 1561.5). This will be accomplished through planning, application, and monitoring of Best Management Practices (BMPs). The project design criteria incorporated into this decision function as BMPs and are designed to protect beneficial uses.

Environmental Justice

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. The analysis focuses on potential effects from the project to minority populations, disabled persons, and low-income groups.

I find that Alternative C - Modified will not have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes.

IMPLEMENTATION

Implementation Date

Implementation of this project may begin no sooner than 45 days plus 5 business days after the date of publication of a notice of decision and availability of the Final Supplemental Environmental Impact Statement in the Bend Bulletin, the official newspaper of record. This project will be implemented on December 1, 2004.

Administrative Review or Appeal Opportunities

Organizations or members of the general public may appeal my decision according to Title 36 CFR Part 215. The 45-day appeal period begins the day following the date the legal notice of this decision is published in the Bend Bulletin, Bend, Oregon, the official newspaper of record. The Notice of Appeal must be filed with the Reviewing Officer at:

Appeal Deciding Officer
Pacific Northwest Region
USDA Forest Service
Attn. 1570 Appeals
333 S.W. First Avenue
PO Box 3623
Portland, OR 97208-3623

Appeals can also be filed electronically at: appeals-pacificnorthwest-regionaloffice@fs.fed.us, or be hand-delivered to the above address between 7:45 AM and 4:30 PM, Monday through Friday except legal holidays. The appeal must be postmarked or delivered within 45 days of the date the legal notice for this decision appears in the Bend Bulletin newspaper. The publication date of the legal notice in the Bend Bulletin newspaper is the exclusive means for calculating the time to file an appeal and those wishing to appeal should not rely on dates or timeframes provided by any other source.

Electronic appeals must be submitted as part of the actual e-mail message, or as an attachment in Microsoft Word (.doc), rich text format (.rtf) or portable document format (.pdf) only. E-mails submitted to e-mail addresses other than the one listed above or in other formats than those listed or containing viruses will be rejected. Only individuals or organizations who submitted substantive comments during the comment period may appeal.

It is the responsibility of those who appeal a decision to provide the Regional Forester sufficient written evidence and rationale to show why my decision should be changed or reversed. The appeal must be filed with the Appeal Deciding Officer § 215.8 in writing. At a minimum, an appeal must include the following:

1. Appellant's name and address (§ 215.2), with a telephone number, if available;
2. Signature or other verification of authorship upon request (a scanned signature for electronic mail may be filed with the appeal);
3. When multiple names are listed on an appeal, identification of the lead appellant (§ 215.2) and verification of the identity of the lead appellant upon request;

4. The name of the project or activity for which the decision was made, the name and title of the Responsible Official, and the date of the decision;
5. The regulation under which the appeal is being filed, when there is an option to appeal under either this part or part 251, subpart C (§ 215.11(d));
6. Any specific change(s) in the decision that the appellant seeks and rationale for those changes;
7. Any portion(s) of the decision with which the appellant disagrees, and explanation for the disagreement;
8. Why the appellant believes the Responsible Official's decision failed to consider the substantive comments and;
9. How the appellant believes the decision specifically violates law, regulation, or policy.

Contact Person

For additional information concerning this decision or the Forest Service appeal process, contact Steve Gibson, EIS Team Leader, Crooked River National Grassland, 813 SW Highway 97, Madras, OR 97741; (541) 475-9272.

CROOKED RIVER NATIONAL GRASSLAND VEGETATION MANAGEMENT / GRAZING ENVIRONMENTAL IMPACT STATEMENT RECORD OF DECISON

Larry A. Timchak

LARRY A. TIMCHAK
Ochoco National Forest Supervisor

9-24-04

DATE

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

Crooked River National Grassland
Vegetation Management / Grazing
Final Environmental Impact Statement

Jefferson County, Oregon
Crooked River National Grassland
Ochoco National Forest and Crooked River National Grassland
USDA Forest Service

September24, 2004

SUMMARY

Introduction

The Crooked River National Grassland Vegetation Management/Grazing Final Environmental Impact Statement (FEIS) presents an analysis of management strategies for the Crooked River National Grassland (Grassland) for the next 10-year planning period. This FEIS analyzes the effects of proposed actions designed to move existing vegetation closer to what historically existed on the Grassland. It also proposes to authorize livestock grazing on areas suitable for that use.

The Grassland is located entirely within the boundaries of Jefferson County in central Oregon (Map 1 - Vicinity Map). There are approximately 173,629 acres incorporated within the administrative boundaries of the Grassland (LRMP, 1989, page 1-4). This includes 111,571 acres under the management and administration of the Forest Service. The remainder of the lands within the Grassland administrative boundary are either privately owned or under the administration of the Bureau of Land Management (BLM), the State of Oregon, or Jefferson County.

History and Background

Initial settlement in the area of the Grassland began in the mid-1800s. To facilitate settlement of the West, Congress enacted the Homestead Act of 1862, which authorized the sale of 160-acre pieces of public land to those willing to live on and cultivate it. The promise of future water and irrigation projects encouraged settlement; by 1904, almost 100 million acres of public land were homesteaded into 500,000 farms.

Locally, the most intense homestead settlement period occurred between 1900 and 1925. To support these families, several towns and post offices were established including: Grizzly, Lamonta, Opal City, Geneva, and Grandview. Most of the homesteaders on the Grassland were dry-land grain farmers. Flatter areas were cleared of sagebrush and native grasses to create crop fields. On steeper slopes, sheep and cattle grazing occurred. Juniper trees were harvested for various purposes including firewood and fence posts. Lumber for homes was often obtained from the nearby sawmill on Grizzly Mountain.

Settlement flourished for a time, but drought conditions, crop failures, and the Depression took their toll. By 1934, fewer than 50 of the nearly 700 homestead families remained. Throughout the county, large acreages of sub-marginal farmland (land that could not profitably grow crops) were being cultivated. Mortgage foreclosures, tax delinquencies, and personal hardships were commonplace in these areas. National attention on this problem eventually led to the development of a "Land Utilization Program" (LUP) in which the Federal government "bought back" homesteaded land from willing sellers and helped them to relocate.

Land purchased under this program was placed into a Land Utilization Project to be "developed" for a more suitable use, such as grazing. More than 11 million acres were "bought back" under the program. In addition 50,000 workers were employed, removing fences and buildings, seeding areas to grass, planting trees, installing erosion control structures, and building water developments. The Bankhead-Jones Farm Tenant Act of 1937 (BJFTA) provided the LUP with congressional support, direction, and stability. Many of the lands making up the Grassland were purchased through the BJFTA.

Although the Land Utilization Program was administered by five different Federal agencies in the first four years of its existence (1934-37), most of the program was implemented by the Resettlement Administration. During that time, much of the LUP land was transferred or sold, principally to other Federal agencies. Of the more than 11 million acres in the LUP, about half were gradually transferred to the Department of the Interior to be administered by the National Park Service, Bureau of Indian Affairs, Fish and Wildlife Service, or Bureau of Land Management. About 5.5 million acres remained within the Department of Agriculture. In 1938, management responsibility for the remaining LUP lands was transferred to the Soil Conservation Service (SCS). At that time, the lands that currently make up the Grassland were part of the Central Oregon Land Utilization Project.

The SCS began large and costly improvement and development activities in the Central Oregon Land Utilization Project almost immediately. Many of these efforts continued after jurisdiction was transferred from the SCS to the Forest Service in 1954. When these activities were halted in the 1980s, about 65,000 acres of previously farmed lands had been seeded to crested wheatgrass or beardless bluebunch wheatgrass to help hold soils in place. In 1960 the Central Oregon Land Utilization Project was formally made the Crooked River National Grassland. It was one of 19 National Grasslands that were created from LUP lands.

Purpose and Need for Action

In March 2003, a watershed analysis was completed that covered the entire Grassland. This analysis resulted in the following recommendations:

- Add a rest rotation grazing system (one pasture of an allotment would be left ungrazed through an entire grazing season) to some of the existing allotments to increase plant growth and productivity, collect more organic matter in the soil, and help promote the rate of ecological succession (The progressive changes in plant communities towards a steady state or more stable plant community).
- Move the pasture fence in the Mud Springs pasture to improve livestock distribution and reduce the amount of grazing on the meadow area next to the stream.
- Rehabilitate about 10,000 acres of old, unproductive crested wheatgrass seedings located primarily within the Willow Creek and Lower Crooked River Valley subwatersheds. If possible, use native plant species and/or appropriate cultivars (a commercially created variety) of native species and non-native plant materials when re-seeding. Another priority identified was the restoration of soils compacted by past farming, homesteading, and grazing activities. The watershed analysis recommended the use of tools like tilling and seeding to reduce compaction in these areas and to increase the rate of recovery.
- Reduce the amount of western juniper woodland to pre-settlement levels (about 20-30 percent of the Grassland) using appropriate tools such as chainsaw cutting and prescribed fire. In certain areas, thin juniper out of shrub and grass stands. In others areas, thin juniper (leaving larger trees) to manage for older juniper stands with a reduced risk of wildfire. The total area of recommended treatment would be about 50,000 acres over the next ten years. The goal of this measure is to maintain grasslands, sagebrush steppe areas, along with a variety of different ages and sizes of juniper trees and juniper tree stands, to provide wildlife habitat for the full range of species known to use the Grassland.

- Do not authorize grazing on the Peninsula, Clevenger, and Goldmine/Falls Allotments and the Squaw Creek Pasture of the Holmes-Squaw Creek Allotment.
- Discontinue re-grazing pastures during the same growing/grazing season (except on the Haystack Butte Allotment where management has proven the ability to meet objectives with re-grazing) to increase plant growth and productivity, collect more organic matter in the soil, encourage native plant species recovery and provide more hiding/nesting cover for ground nesting birds.

Purpose Statements

The purposes of this project are to:

- Restore and/or rehabilitate Grassland vegetation to make it more closely resemble pre-settlement conditions.
- Meet the requirements of Section 504 of the 1995 Rescission Act; requiring National Environmental Policy Act (NEPA) analysis and decisions for all grazing allotments by 2011.
- Re-authorize grazing on suitable lands (FEIS, Chapter 3, Section 3.9.2.3.3).

Need Statements

Based on the recommendations of the watershed analysis and other information gathered by the team of experts preparing this FEIS, the following management needs were identified.

- ***There is a need for the density and distribution of western juniper to more closely reflect the levels within their historic range of variability, and for the maintenance of existing sagebrush steppe sites where juniper is encroaching.***

    - In the late 1990s scientists working for the Interior Columbia Basin Ecosystem Restoration Project (ICBEMP) analyzed changes in vegetation throughout the Columbia River Basin over the last 100 years. They determined that wheatgrass-bunchgrass, fescue-bunchgrass and big sagebrush cover types have decreased significantly (66-75%, 53-92% and 84%, respectively) throughout the region. At the same time, they found that there has been a significant increase in the juniper-sagebrush cover type (163%). These findings led the scientists to identify the sagebrush steppe ecosystem as an imperiled habitat in the Columbia River Basin.

    - A similar trend is occurring throughout Central Oregon, including within the Crooked River National Grassland. Since the turn of the century, western juniper has been actively expanding its range into adjacent shrublands and grasslands. Of the more than 2.3 million acres of juniper woodland in Oregon, nearly 90 percent is composed of young woodlands with trees less than 150 years old (young for trees which have an average life span of 400 to 700 years).

    - A recent comparison between historic vegetation conditions and current conditions conducted by the Grassland found that:

        - The mid-seral juniper cover type (with juniper trees mainly in the 5-9 inch diameter size class) is higher than its historic occurrence
        - The late-seral juniper cover type (with juniper trees mainly in the, 9-20.9 inch diameter and greater than 20.9 inch diameter size class) is less than its historic occurrence.
        - The early-seral grass and shrub cover types are less than their historic occurrence.

    - As juniper becomes the dominant plant species on what was a sagebrush/bunchgrass site, many predictable changes may occur. These include:

        - The loss of mid-sized shrubs such as sagebrush, bitterbrush, and rabbitbrush.
        - The conversion from shade intolerant grasses to shade tolerant grasses under the juniper tree canopies (e.g., from bluebunch wheatgrass to Idaho fescue).
        - On many sites as cover type conversion occurs from sagebrush steppe to juniper woodland, the understory converts from deep-rooted native perennial grasses and forbs to Sandberg's bluegrass (shallow-rooted native grass) and annual forbs. This change reduces plant species diversity.

    - At present, 48 percent of the Grassland consists of grass and shrublands. However, most of these areas contain young juniper trees. Without active management (i.e., prescribed fire or thinning) the percentage of grass and shrublands is expected to continue to decrease as more sites become dominated by juniper.

    - Wildlife species dependent on sagebrush shrubland habitat such as the sage sparrow and sage thrasher are negatively affected when sites progress from sagebrush steppe (grassland and shrubland) to juniper woodland. Winter forage for mule deer decreases when antelope bitterbrush is out-competed by juniper. Pronghorn antelope prefer "open spaces" that allow them to see predators. Their habitat is lost with increasing juniper numbers and densities. The Grassland's Sagebrush Habitat Restoration Initiative (FEIS, Chapter 1, Section 1.2.3) envisions the restoration of the plants and animals associated with sagebrush steppe ecosystems.

    - Management direction in the Land and Resource Management Plan (LRMP) for the Grassland also emphasizes preserving grasslands and shrublands:

        - <u>Management Area G1 - Antelope Winter Range:</u> Antelope winter range will generally be made up of open grassland with shrub heights at or below 24 inches, but definitely not over 30 inches in height (LRMP p. 4-23).
        - <u>Management Area G2 - Metolius Deer Winter Range:</u> The forage/cover ratio will be at the best level of 60/40 wherever that is possible and will be well distributed. A healthy and productive shrub component would be present (LRMP p. 4-23).
        - <u>Management Area G3 - General Forage:</u> The management area will contain the natural makeup and structure of native grasses, sedges, forbs, and desirable edible shrubs. Undesirable forage plants, such as sagebrush and juniper that decrease range productivity will be managed using the tools of fire and livestock to reduce their competition while keeping with multiple use objectives (LRMP p. 4-25).

    - Old-growth juniper existed historically on the Grassland. Information and photographs from the settlement period suggest that old-growth juniper primarily existed on rocky ridge-tops and other areas where wildfire would not spread naturally. Most of the standing old-growth juniper that existed prior to settlement was cut and used by the homesteaders for fences, firewood, and other uses. Today individual old trees remain, which are either scattered around the Grassland or located in the one identified old-growth stand located on the south slope of Gray Butte. This FEIS does not propose to treat biological old-growth stands, and individual old growth trees are protected by the project design criteria of the proposed actions.

- ***There is a need for succession to advance on some historically seeded sites beyond the Sandberg's bluegrass-dominated plant communities which currently***

exist, by promoting a shift in species composition toward the historic dominance of deep-rooted native bunchgrasses and forbs.

- About one half of the Grassland was dry-land farmed for approximately 40 years during the late 1800s and early 1900s. Then, between 1935 and 1965, 65,000 acres were seeded to non-native plant species such as crested wheatgrass and/or cultivars (a commercially created variety) of native plants such as beardless bluebunch wheatgrass (Whitmar).

- A range of ecological conditions currently exists on these seeded sites. Some have moved from a monoculture (single species stand) of crested wheatgrass toward historic plant species makeup and structure. The majority of these sites consist of native plants such as: sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Sandberg's bluegrass, and various native forbs.

- Other sites exhibit slow or no progress (ecological succession) toward native plant associations. Undesirable plants such as: rabbitbrush, crested wheatgrass, and Sandberg's bluegrass (a shallow-rooted native grass) continue to dominate these areas.

- Scientists working on the ICBEMP observed and reported that there was a decline in native bunchgrasses (i.e. bluebunch wheatgrass) and an increase in undesirable native plants (i.e. Sandberg's bluegrass) as well as exotic seeded grasses (i.e. crested wheatgrass). In a letter sent to the Grassland after a recent field trip to these sites, Oregon State University professor, Tamzen Stringham noted, "… the increase in Sandberg's bluegrass has set up a positive feedback loop that promotes the Sandberg's bluegrass community at the expense of deep-rooted perennials" (such as bluebunch wheatgrass).

- Sandberg's bluegrass cures and dries out earlier than other grass species, making it less desirable as a food source to livestock and big game. Providing desirable feed for antelope is a concern in antelope winter range. Sandberg's bluegrass also provides less structural variety than deep-rooted bunchgrasses, which is a feature important to ground nesting birds such as the horned lark, western meadowlark, and California quail.

- ***There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area.***

  - Today, there are 23 grazing allotments that are grazed under a permit issued to a single permittee, the Gray Butte Grazing Association (GBGA). The 20 members of the GBGA currently graze approximately 2,500 head of livestock on the 23 allotments.

  - There is an economic demand for the forage produced on the Grassland. This demand is demonstrated by the yearly grazing of most allotments on the Grassland over the past fifty years.

  - Jefferson County is heavily dependent on agriculture. In 2002, livestock sales generated more than $7 million. Most of the Grassland grazing permittees farm and/or ranch in Jefferson County near the Grassland. These Grassland permittees are fully involved in agriculture as a business and a lifestyle. The Grassland provides forage for the operations of approximately 20 permittees for four to seven months annually. Of the estimated 11,000 cattle in Jefferson County, about 23 percent (2,500) of them graze on the Grassland. The Grassland Land and Resource Management Plan (LRMP, 1989), as well as Forest Service policy, allows livestock grazing on suitable land.

- ***There is a need for a diversity of grass stubble heights (2-15 inches) at the end of the grazing season in order to provide for an insufficiency of soil organic matter on some historically homesteaded and farmed sites and to provide habitat for ground nesting birds. Leaving sufficient stubble (grass height) at the end of the grazing season will aid in the accumulation of organic matter, which in turn aids the establishment of deep-rooted native grass species. A range of stubble heights would also provide habitat for ground nesting birds such as the California quail, western meadowlark, horned lark, and the burrowing owl.***

    - Most of the grazing allotments on the Grassland have used modified deferred rotation grazing systems (using several pastures one after the other with at least one pasture being grazed after grass seed has ripened on the stalk) during the past decade. Most allotments have six to nine pastures. Each allotment has one herd of livestock that moves through the pastures with the objective of grazing half of the annual growth (50 percent utilization by weight). On many allotments, re-grazing the first grazed pasture is part of the existing Allotment Management Plan. Re-grazing is designed to capture (graze) the plant re-growth that occurs after the pasture has been grazed early in the season.

    - The practice of re-grazing pastures produces evenly used pastures but does not generally leave stubble heights over four inches. Although livestock grazing use is more evenly spread across the landscape, habitat for ground nesting birds is greatly reduced. Many ground dwelling birds need taller (greater than six inches) grass to provide hiding cover for nests as well as over wintering habitat and hiding cover from predators.

    - Discontinuing the practice of re-grazing pastures and establishing a rest rotation grazing system (one pasture of an allotment would be left ungrazed through an entire grazing season) would result in a range of stubble heights (from 4 to 14 inches) across each allotment at the end of the grazing season. This would, in turn, result in greater habitat variety across the Grassland and help provide habitat for a wide array of wildlife species that depend on taller grass heights. These practices would also help meet LRMP management direction for MA-G1 (Antelope Winter Range) to "have an abundance of fall green up left for antelope winter use".

    - In addition, using a rest rotation grazing system on certain allotments would increase the collection of organic matter on the soil surface and enhance forb, grass and shrub seed production and the health and establishment of deep-rooted native perennial plants. Finally, adding a rest pasture would increase forage production because individual plants would be allowed to build reserves stored in their root system and increase plant health and productivity.

- ***There is a need to close three allotments and one pasture of another allotment to livestock grazing.***

    - **Peninsula Allotment** There is a need to stop allowing grazing on this allotment because of downward ecological trends. In addition, all range improvements including fences, pipelines, and stock tanks are in disrepair. This allotment is located on a peninsula with a single entry point and access limited to only one route through a large

subdivision. Two private in-holdings within the allotment are currently being developed into residential areas. No fences separate the private land from the Grassland.

- **Clevenger and Goldmine/Falls Allotments** There is a need to stop allowing grazing on these allotments because both have been vacant (not had a permittee) for more than ten years and there is no demand for the use of either one. In the past they were grazed with adjacent private land. As this does not appear to be possible any longer, starting grazing would require extensive fence construction and the development of watering facilities. In addition, both allotments are partially within the boundaries of the Middle Deschutes Wild and Scenic River corridor (livestock are not allowed to graze within the canyon portion of the corridor).

- **Squaw Creek Pasture of the Holmes-Squaw Creek Allotment** There is a need to close this pasture to grazing because the combination of; occupied bull trout habitat, steelhead essential habitat, and management of the canyon portion of Squaw Creek as a scenic corridor; make grazing of this pasture unfeasible.

Issues

Based on a review of issues and concerns raised during the scoping process, five significant issues were identified. These issues were used to develop alternatives to the proposed action and are discussed in the environmental consequences section of the FEIS.

Issue 1

- If not managed properly, livestock use can cause downward ecological trends and, therefore, loss of wildlife habitat.

Issue 2

- Proposed soil-disturbing activities such as tilling, prescribed fire, mechanical juniper removal, and grazing have the potential to increase the amount and distribution of noxious weeds and invasive plants.

Issue 3

- Proposed management activities such as tillage, prescribed fire, juniper control, and grazing have the potential to affect water quality and quantity by changing upland and riparian vegetative cover and complexity.

Issue 4

- Proposed management activities (grazing, tilling/seeding/fertilization, prescribed fire, and juniper control) may affect the quality, quantity and distribution of wildlife habitat, specifically mule deer and pronghorn LRMP designated winter range (Map 16 - LRMP Management Area Map).

Issue 5

- Manipulation of western juniper on the Grassland (how many acres and the size and location of juniper to be cut) can affect visual qualities, old growth, and habitat diversity values.

Issue 6

- Grazing domestic sheep in potential bighorn sheep habitat increases the risk of transmitting disease if bighorn sheep are reintroduced to their historic habitat on the Grassland.

Other Issues

Other issues were identified through the scoping process and by the Interdisciplinary Team but were dropped from analysis for various reasons such as: the issue being outside the scope of the proposed action or the issue was mitigated through the use of project design criteria (sideboards applied to proposed actions to minimize/avoid adverse effects).

Alternatives

This section provides a discussion of a no action alternative and three action alternatives. It also briefly discusses other alternatives that were considered but dropped from further consideration and the reasons further analysis was not conducted on them, project design criteria and monitoring requirements, alternative comparisons, and a summary table of expected effects by resource (Table 2-8).

Alternatives Considered but Dropped From Further Consideration

- ***No Grazing - Vegetation Treatment Alternative***

  This alternative proposes to stop livestock grazing on the whole Grassland but implement the Proposed Action vegetation treatments as described under Alternative C - Proposed Action. This alternative was dropped because it does not meet the purpose and need for the project.

  > *"There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area"* (Section 1.4.2.3, Purpose and Need).

  Other purposes and needs that refer to moving the existing vegetation makeup and structure closer to what was on the Grassland historically (such as juniper control to maintain sagebrush steppe plant communities) would be met with this alternative.

  In addition, Alternative A - No Action provides for the no grazing option to be considered, while the analysis of Alternative C - Proposed Action reveals the effects of the vegetative treatments. Therefore, this alternative is a combination of two alternatives that were analyzed in detail and would not add to the range of alternatives considered.

- ***No Grazing on the Westside of the Grassland (west of the Deschutes River) – Vegetation Treatment Alternative***

  This alternative proposes to eliminate livestock grazing west of the Deschutes River on the Grassland but retain the vegetation treatments proposed in Alternative C - Proposed Action. This alternative was dropped from further consideration because it does not meet the purpose and need of authorizing grazing on suitable lands.

  > *"[t]here is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area"* (Section 1.4.2.3, Purpose and Need).

  Other purposes and needs that refer to moving the existing vegetation makeup and structure closer to what was on the Grassland historically (such as juniper control to maintain sagebrush steppe plant communities) would be met with this alternative.

  Alternatives A through D provide the opportunity for the decision-maker to decide to or not to reauthorize grazing on the west side of the Grassland. Similar to the previous alternative that was dropped, this alternative is a combination of two alternatives that were analyzed in detail and would not add to the range of alternatives considered.

Alternatives Analyzed in Detail

The following is a summary of the alternatives analyzed in this FEIS. Please refer to Chapter 2 Section 2.3 for a detailed description of each alternative.

- **Alternative A - No Action**
  - This alternative would stop allowing livestock grazing on 102,938 acres of the Grassland.
    - Twenty-three allotments would be closed to grazing (Map 7 - Alternative A - No Action).

        - New allotment management plans would not be written.
        - No new grazing permits would be issued.

    - The GBGA permittees would stop maintaining existing range improvements.
        - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
        - Approximately 30 road cattleguards would remain.
        - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

    - As compared to the Proposed Action, Alternative A WOULD NOT implement the following actions:
        - Authorization of any livestock grazing on the Grassland.
        - Establishment of forage reserves.
        - New fence construction.
        - Removal of two cattleguards.
        - Western juniper removal.
            - Prescribed fire, chain saw felling, or other mechanical treatments used to reduce juniper densities.
        - Seeding in crested and tall wheatgrass seedings.
            - Tilling, disking, or fertilizing.

- **<u>Alternative B - Current Management</u>**

  This alterative reflects current grazing management as stated in existing allotment management plans and changed by annual operating instructions.

    - This alternative would allow livestock grazing on 23 grazing allotments totaling approximately 102,938 acres of the Crooked River National Grassland. Authorized stocking rates would be 21,714 animal unit months (AUMs, a measure of forage) of livestock grazing through the Gray Butte Grazing Association. This would be the maximum allowable stocking rate on the Grassland. Actual numbers and length of grazing allowed each year would depend upon meeting grass stubble height standards.
        - Graze 12 allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Gorge, Grizzly, Lone Pine, North, Round Butte, Peninsula, Rush, and Steer) with versions of deferred rotation grazing systems.
        - Graze three allotments (Holmes-Squaw Creek, Lower Desert, and Williams) under a straight rotation grazing system.
        - Graze the Juniper Butte Allotment under a short duration grazing system.
        - Graze seven allotments/pastures (Canadian Bench, Clevenger, Cotter Pond, Devine, Goldmine/Falls, Kennedy, and Weaning allotments) under a season long (one pasture) grazing system with short grazing seasons. Season long grazing usually occurs when livestock have only one pasture to graze.

    - The GBGA permittees would continue to maintain existing range improvements.
        - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
        - Approximately 30 road cattleguards would remain.
        - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

- As compared to the Proposed Action, Alternative B WOULD NOT implement the following actions:
  - Establishment of forage reserves.
  - New fence construction.
  - Removal of two cattleguards.
  - Western juniper removal.
    - Prescribed fire, chain saw felling, or other mechanical treatments used to reduce juniper densities.
  - Seeding in crested and tall wheatgrass seedings.
    - Tilling, disking, or fertilizing.

- **Alternative C - Proposed Action**
  - Allow livestock grazing on approximately 82,923 acres (19 allotments) of the Grassland (Map 9 - Alternative C - Proposed Action). Reduce the allowed livestock stocking rate to 20,289 AUMs. Actual numbers and length of grazing would depend upon meeting grass stubble height standards.
    - Graze two allotments (Gorge and Steer) with a form of deferred rotation grazing.
    - Graze two allotments (East Winter and Holmes-Williams) under a straight rotation grazing system.
      - The Holmes Pasture in the Holmes-Squaw Creek Allotment would be combined with the Williams Allotment. The new allotment, named the Holmes-Williams Allotment, would have two pastures totaling 2,620 acres. This allotment is within the Metolius Deer Winter Range; therefore, the livestock would generally be off of the allotment prior to August 1st.
      - The Squaw Creek Pasture (5,195 acres) would remain closed to grazing (Map 9 - Alternative C - Proposed Action). Grazing will not be allowed within the Squaw Creek Pasture to avoid occupied bull trout habitat and essential steelhead habitat, and to prevent grazing within the proposed scenic portion of the Squaw Creek corridor.
      - Create the East Winter Allotment by removing the East and West Winter Pastures from the Lower Desert Allotment. This allotment would have eleven Forest Service pastures totaling approximately 1,521 acres (Map 9 - Alternative C - Proposed Action). This allotment would also be managed with mule deer winter range enhancement as an objective. Bitterbrush is a key wildlife browse species (food source) in the winter range and grazing would be managed to maintain bitterbrush leaf and leader growth for big game. Livestock use would generally not be allowed after August 1
    - Divide the Juniper Butte Allotment into two new allotments; Juniper Butte to the west and Haystack to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line. This change is needed because Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway.
      - Graze the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system (rapidly move livestock from one pasture to the next, often returning to pastures used earlier in the grazing season).
      - Graze the new Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a deferred rotation grazing system.
    - Graze ten allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush) with a rest rotation grazing system. This action would increase the collection and buildup of organic matter in and on the soil needed to: restore deep-rooted native bunchgrasses, increase

the variety of stubble heights left following grazing, and aid the health and productivity of the existing plants.

- ❖ Move the Mud Springs Pasture boundary fence in the Fox Allotment to more evenly spread livestock use across the landscape and reduce the amount of grazing on the Mud Springs Flat area. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).

- Graze five allotments/pastures (Canadian Bench, Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons).
- Stop allowing livestock grazing on four allotments/pastures (Clevenger, Goldmine/Falls, and Peninsula Allotments and the Squaw Creek Pasture of the Holmes – Squaw Creek Allotment) totaling 8,233 acres of Grassland (Map 9 - Alternative C - Proposed Action).
  - ❖ Two cattleguards would be removed from closed allotments using a backhoe.
- Manage two existing allotments (Canadian Bench and Lower Desert) as forage reserves totaling approximately 11,782 acres of the Grassland.
  - ❖ In the Lower Desert Allotment, approximately 15 miles of new three-wire fence line would be constructed. Approximately 10 water trough sites would be established and water would have to be hauled to water livestock when the reserves were used. This allotment would be grazed on a rest-rotation system. The forage reserves would only be used by Grassland permitted livestock while/if their assigned allotment is being rehabilitated/restored (which may require rest from grazing).
  - ❖ The Canadian Bench Allotment would only be grazed by domestic sheep because of the large number of private in holdings, the prohibitive costs of fencing, and the lack of surface water sources. No fences would be constructed. All water would be hauled.

- The GBGA permittees would continue to maintain existing range improvements.
  - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
  - Approximately 30 road cattleguards would remain.
  - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

- Remove western juniper on approximately 50,000 acres over the next ten years (Map 9 - Alternative C - Proposed Action) using:
  - Chainsaw felling on approximately 27,100 acres.
  - Chainsaw felling followed by low intensity prescribed fire seven plus years following felling on approximately 5,200 acres.
  - Prescribed burning approximately 7,500 acres.
  - Shrub mowing (mechanical treatment) on approximately 490 acres.

- Rehabilitate approximately 8,350 acres of stagnant "old" crested and tall wheatgrass seedings over the ten year planning period (Map 9 - Alternative C - Proposed Action). Of the 8,350 acres proposed to be "treated" only approximately half or about 4,000 acres would actually be tilled and seeded. The objective is to create a mix of cover types; therefore sagebrush islands will be left within the treatment areas. Projects would include:

- Tilling down to a 10 inch soil depth using a farm or crawler tractor pulling rangeland disks up to 16 feet wide. Where tilling is planned to occur all young juniper (less than 80 years old) would be removed prior to tilling.
- Drilling and seeding to a depth of 1-3 inches using a rangeland drill pulled by a farm or crawler tractor.
- Broadcast seeding (throwing seed through the air to land on the soil surface).
- Fertilizing seedings where needed.

- **Alternative D**

Alternative D was created as a result of comments received during scoping, analysis of those comments and additional review and analysis of proposed treatment activities. Analysis of comments received during scoping resulted in the elimination of the forage reserves. Coupled with a review of past vegetation activities, including prescribed burning, past juniper cutting, wildfire and land management activities on adjacent lands, this analysis also resulted in a reduction in the number of acres proposed for juniper control. This alternative addresses:

Issue 1 "If not managed properly, livestock use can cause downward ecological trends and therefore loss of wildlife habitat".
Issue 2 "noxious weeds and invasive plants".
Issue 3 "riparian vegetation".
Issue 4 "mule deer and antelope winter range".
Issue 5 "juniper to be controlled".

- Allow livestock grazing on approximately 88,085 acres (20 allotments) of the Grassland (Map 10 - Alternative D). Reduce the allowed livestock stocking rate to 20,983 AUMs. Actual numbers and length of grazing would depend upon meeting grass stubble height standards.
  - Graze two allotments (Gorge and Steer) with a form of deferred rotation grazing.
  - Graze one allotment (Holmes-Williams) under a straight rotation grazing system.
    - The Holmes Pasture in the Holmes-Squaw Creek Allotment would be combined with the Williams Allotment. The new allotment, named the Holmes-Williams Allotment, would have two pastures totaling 2,620 acres. This allotment is within the Metolius Deer Winter Range; therefore, livestock would generally be off of the allotment prior to August 1st.
    - The Squaw Creek Pasture (5,195 acres) would remain closed to grazing (Map 10 - Alternative D). Grazing will not be allowed within the Squaw Creek Pasture to avoid occupied bull trout habitat and essential steelhead habitat, and to prevent grazing within the proposed scenic portion of the Squaw Creek corridor.
  - Divide the Juniper Butte Allotment into two new allotments; Juniper Butte to the west and Haystack to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line. This change is needed as Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway.
    - Graze the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system.
    - Graze the new Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a deferred rotation grazing system.
  - Graze ten allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush) with a rest rotation grazing system. This action would increase the collection and buildup of organic matter in and on the soil needed to: restore deep-rooted native bunchgrasses, increase

the variety of stubble heights left following grazing, and aid the health and productivity of the existing plants.

- ❖ Move the Mud Springs Pasture boundary fence in the Fox Allotment to more evenly spread livestock use across the landscape and reduce grazing on the Mud Springs Flat area. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).
- ❖ Approximately 6,683 acres of the Grassland in the Lower Desert Allotment would be open to grazing but managed to maintain and/or enhance the quality of mule deer winter range forage. Livestock would not generally be allowed to graze after August 1 in order to avoid conflicts between livestock and mule deer needs.
- ❖ Construct approximately 15 miles of new three-wire fence line in the Lower Desert Allotment.

- Graze four allotments/pastures (Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons).
- Manage the Canadian Bench Allotment (1,592 acres of Grassland) as a vacant allotment (unassigned and unoccupied) under this alternative. There is currently no demand for this allotment due to its lack of boundary fences and water developments.
- Stop allowing livestock grazing on five allotments/pastures (Clevenger, Goldmine/Falls, and the Peninsula Allotment , the Squaw Creek Pasture of the Holmes – Squaw Creek Allotment and portions of the Lower Desert Allotment) totaling 8,233 acres of the Grassland (Map 10 - Alternative D).
  - ❖ The portions of the Lower Desert Allotment proposed to be closed to grazing are located on private lands that historically were included in the allotment. Today the private land ownership has changed and the ability to graze within this allotment questionable.
  - ❖ Two cattleguards would be removed from closed allotments using a backhoe.

- The GBGA permittees would continue to maintain existing range improvements.
  - Approximately 750 miles of existing fences on the Grassland would remain including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
  - Approximately 30 road cattleguards would remain.
  - Approximately 100 miles of buried water pipelines, 29 wells, and 175 water troughs located on the Grassland would remain.

- Remove western juniper on approximately 29,590 acres of over the next ten years (Map 10 - Alternative D) using:
  - Chainsaw felling on approximately 10,800 acres.
  - Chainsaw felling followed by low intensity prescribed fire seven plus years following felling on approximately 5,200 acres.
  - Prescribed burning on approximately 4,760 acres.
  - Shrub mowing (mechanical treatment) on approximately 490 acres.

- Rehabilitate approximately 8,350 acres of stagnant "old" crested and tall wheatgrass seedings over the ten year planning period (Map 10 - Alternative D - Proposed Action). Of the 8,350 acres proposed to be "treated" only approximately half or about 4,000 acres would actually be tilled and seeded. The objective is to create a mix of cover types; therefore sagebrush islands will be left within the treatment areas. Projects would include:

- Tilling down to a 10 inch soil depth using a farm or crawler tractor pulling rangeland disks up to 16 feet wide. Where tilling is planned to occur all young juniper (less than 80 years old) would be removed prior to tilling.
- Drilling and seeding to a depth of 1-3 inches using a rangeland drill pulled by a farm or crawler tractor.
- Broadcast seeding.
- Fertilizing seedings where needed.

Project Design Criteria and Monitoring Requirements

Project Design Criteria (PDC) for; livestock grazing management, water quality/fisheries, and wildlife, have been built into the action alternatives (Alternatives B, C, and D). Additional PDC for: cultural resources, fuels and prescribed burning, livestock grazing management, noxious weeds, old growth western juniper management, recreation, seeding activities, and soils are proposed for Alternatives C and D. These criteria guide the design and implementation of the proposed actions to minimize or avoid adverse impacts. In addition, monitoring requirements are built into the design of each alternative. Please refer to Chapter 2 Sections 2.4 and 2.5 for more information about PDC and monitoring requirements.

Alternative Comparisons

The following table displays the expected outputs for each alternative.

Table Summary 1 - Proposed Vegetation Treatments and Grazing Disposition by Alternative

VEGETATION TREATMENTS/GRAZING DISPOSITION		ALTERNATIVES A	B	C	D
Acres of Juniper Density Control - chainsaw		0	0	27,095	10,803
Acres of Juniper Density Control - chainsaw/prescribed fire		0	0	5,195	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire		0	0	7,510	4,757
Acres of Sagebrush/Juniper cover control - mechanical		0	0	488	488
Acres of Juniper Control as part of seeding treatments - chainsaw		0	0	8,344	8,344
	Total Acres of Juniper Control	0	0	48,633	29,588
	Total Acres of Till/Seed/Fertilize	0	0	8,344	8,344
	Total Acres of Vegetation Treatment	0	0	48,633	29,588
Acres Open to Domestic Livestock Grazing		0	102,938	82,923	88,085
Acres Vacant to Domestic Livestock Grazing		0	0	0	1,592
Acres Closed to Domestic Livestock Grazing		102,938	0	8,233	13,261
Acres in Forage Reserve		0	0	11,782	0
Total Acres		**102,938**	**102,938**	**102,938**	**102,938**

Table Summary - 2 The expected effects to the various resources by each alternative.

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
Wildlife	See following table	See following table	See following table	See following table
Soils	Juniper density would continue to increase; coupled with increased fine fuel build-up with no grazing would create an environment ready for more large severe fires. These fires would volatilize minerals decreasing overall productivity and exposing more bare soil. This effect would create higher risk for soil erosion from wind and rain. Other identified soils (in the homesteaded and seeded areas) would not be restored through tilling and seeding, therefore retarding restoration.	Juniper density would continue to increase creating an environment ready for large severe fires (less risk than Alternative A as livestock grazing would reduce fine fuel buildup). These fires would volatilize minerals decreasing overall productivity exposing bare soil. The effect would be to create higher risk for soil erosion from wind and rain. Other identified soils (in the homesteaded and seeded areas) would not be restored through tilling and seeding, therefore retarding restoration. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less than 1 % of the Grassland).	Juniper density would decrease as the result of the proposed juniper cutting and prescribed burning. The effect would be to maintain and or increase the acreage of sagebrush steppe that in turn would provide higher % of ground cover (as opposed to closed canopy juniper stands), which would provide adequate or better ground cover for the protection of soils. Other identified soils (in the homesteaded and seeded areas) would be restored through tilling and seeding, therefore aiding in the advancement of succession. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less than 1 % of the Grassland). This alternative would provide more organic matter available for soil building as rest would be added to many of the allotment grazing rotation. Addition organic matter could aid in the establishment of deep-rooted native perennial grasses and the advancement of succession toward HRV.	Juniper density would decrease as the result of the proposed juniper cutting and prescribed burning. The effect would be to maintain and or increase the acreage of sagebrush steppe which in turn would provide higher % of ground cover (as opposed to closed canopy juniper stands) which would provide adequate or better ground cover for the protection of soils. With regards to the effects of juniper density control provided with this alternative, they would be less than that of alternative C as fewer acres would be treated. Other identified soils (in the homesteaded and seeded areas) would be restored through tilling and seeding, therefore aiding in the advancement of succession. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less that 1 % of the Grassland). This alternative would provide more organic matter available for soil building because rest would be added to many of the allotment grazing rotation. Addition organic matter could aid in the establishment of deep-rooted native perennial grasses and the advancement of succession toward HRV.
Non-native Invasive Weed Species	The primary action under this alternative is to allow juniper to continue expanding across the Grassland landscape. On some sites (flat and southern exposures) percent bare soil would increase as juniper canopies close. Bare soil provides an environment suitable for the spread of invasive plants.	The primary actions under this alternative are to allow juniper to continue expanding across the Grassland landscape and allow livestock grazing. On some sites (flat and southern exposures) percent bare soil would increase as juniper canopies close. Bare soil provides an environment suitable for the spread of invasive plants.	The primary actions under this alternative are to allow livestock grazing, control juniper density using chainsaw cutting and prescribed fire and to till, seed and possibly fertilize approximately 4,000 acres. There is a risk to the establishment of invasive plant species on the 4,000 acres proposed to be tilled and seeded.	The primary actions under this alternative are to allow livestock grazing, control juniper density using chainsaw cutting and prescribed fire and to till, seed and possibly fertilize approximately 4,000 acres. There is a risk to the establishment of invasive plant species on the 4,000 acres proposed to be tilled and seeded.

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
	Large wildfires, more probable with this alternative create severe exposed soil, which also provide an excellent environment for establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	Selective livestock grazing may favor invasive plant species as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	Through the tilling process, bare soil is exposed for a time (until seeded and other species establish). Selective livestock grazing may favor invasive plant species as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	Through the tilling process, bare soil is exposed for a time (until seeded and other species establish). Selective livestock grazing may favor invasive plant species, as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.
PETS Plants	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on TES plants..	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on TES plant species.	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on TES plant species.	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on TES plant species.
Fire and Fuels	Without vegetation treatments proposed under Alternatives C and D and without livestock grazing that reduces fine fuel accumulation, the risk of severe large wildfires on the Grassland increases. These fires could be destructive not only to the Grassland but properties adjacent to the Grassland. Rates of fire spread would decrease over time as the shrubs and grasses decline as juniper increases. The risk of crown fires would remain or increase. The risk of long-range spotting would be high. Air quality would be affected and unmanageable with wildfires (versus prescribed fires).	Without vegetation treatments proposed under Alternatives C and D, the risk of severe large wildfires on the Grassland increases but not as much as Alternative A as livestock would reduce the risk of spread of wildfire as they consume fine fuels needed for fire spread. These fires could be destructive not only to the Grassland but properties adjacent to the Grassland. Rates of fire spread would decrease over time as the shrubs and grasses decline as juniper increases. The risk of crown fires would remain or increase. The risk of long-range spotting would be high. Air quality would be affected and	With proposed juniper density treatments and continued livestock grazing the risk of large fire spread is reduced significantly. Without the quantity of fine fuels produced without grazing, the risk of fire spread is reduced. Crown fires may exist in the patches of juniper left after treatment but would not be as continuous as under Alternatives A and B and therefore easier to control.	With proposed juniper density treatments and continued livestock grazing the risk of large fire spread is reduced significantly. Without the quantity of fine fuels produced without grazing, the risk of fire spread is reduced. Crown fires may exist in the patches of juniper left after treatment but would not be as continuous as under Alternatives A and B and therefore easier to control.

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
		unmanageable with wildfires (versus prescribed fires).		
Heritage Resources	No effects to heritage resources except from other ongoing activities such as recreation (off-road vehicle use, camping etc.) and fuel treatment projects (not included in the EIS) that may be near or on heritage sites.	No effects to heritage resources except from other ongoing activities such as recreation (off-road vehicle use, camping etc.) and fuel treatment projects (not included in the FEIS) that may be near or on heritage sites. Grazing effects to heritage resources would not be measurable.	Project design criteria prescribed within Alterative C protects known heritage sites. There is a low risk of disturbance to unknown sites. High risk areas are avoided during project layout and during heritage surveys through consultation. Following consultation, project design would be altered to avoid known and high risk sites.	Project design criteria prescribed within Alterative D protects known heritage sites. There is a low risk of disturbance to unknown sites. High risk areas are avoided during project layout and during heritage surveys through consultation. Following consultation, project design would be altered to avoid known and high risk sites.
Fisheries and Hydrology	Expansion of juniper may influence the erodability of soils by out competing grasses and shrubs for water and nutrients. If erosion increases, sediment transport to perennial streams could increase yet not likely to be measurable. Differences in sedimentation from roads and recreational use and removing livestock would be difficult to measure. No direct impact to aquatic species. The risk to aquatic species is low.	Perennial streams and springs are protected with fencing. Indirect effects of grazing on aquatic resources are low risk. Livestock are not grazing within riparian zones except in Windom and Springer pastures, and then only used occasionally to improve grass vigor and wildlife habitat. Effects to aquatic resources are low because of current stable and upward ecological trends on the uplands and fenced riparian zones. The ungrazed riparian zones on the Grassland provide sediment filtering. No direct impact to aquatic species. The risk to aquatic species is low.	Livestock are not grazing within riparian zones except occasionally in Windom and Springer riparian pastures (grazed to maintain grass vigor and improve wildlife habitat). This alternative would increase proposed vegetation treatments that have the general effect of increasing grass and shrub ground cover would increase filtering vegetation and could reduce sedimentation reaching perennial streams more than in Alternatives A and B. Tilling, seeding, and fertilizing as proposed would have no measurable effect direct or indirect effects on aquatic species as no sediment is expected from these sites. Any sediment generated from these projects would not be disguisable from sediment generated. Effects to aquatic species would be low.	The same vegetation treatments are proposed under Alternative D as were in C except that the treated acreage under D is generally less. All treatments in Alternative C and D would increase filtering vegetation and could reduce sedimentation from reaching perennial streams more than Alternatives A & B. Proposed vegetation treatments would increase that have the general effect of increasing grass and shrub ground cover would increase filtering vegetation and could reduce sedimentation reaching perennial streams. Baseline sedimentation from the uplands that enters streams may be reduced as a result of increased understory. For Alternative D, effects are similar to Alternative C. Effects to aquatic species would be low.
Forage Production	As juniper density increases, over time forage production would decline substantially (more than 50 percent). Following the removal of livestock grazing generally forage production would increase for a few years and then decline. With wildfire, forage production would also increase for a few years after the fire and then decline as the plants become stagnant.	Over time as juniper density increases, forage production would decline substantially (more than 50 percent). Livestock grazing would continue to effect fire spread as livestock consume fine fuels needed for fire spread. Therefore the positive effects of fire for forage production would be reduced by livestock.	Juniper density control would aid forage production, as grasses would continue occupy sites. Proposed tilling would have a positive effect on forage production, especially for the few pastures proposed for seeding, but overall these projects would not affect forage production for the Grassland more than 5 percent at the most. Annual growing conditions are far more significant for forage production. The application of rest to many of the allotment grazing plans will eventually increase forage production as the rest	Juniper density control would aid forage production, as grasses would continue occupy sites. Proposed tilling would have a positive effect on forage production, especially for the few pastures proposed for seeding, but overall these projects would not affect forage production for the Grassland more than 5 percent at the most. Annual growing conditions are far more significant for forage production. The application of rest to many of the allotment grazing plans will eventually increase forage production as the rest

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
			period will increase plant vigor in general.	period will increase plant vigor in general.
Geology and Minerals	This alternative would not likely have an effect to slope stability. There would be no treatments on or adjacent to dormant landslide terrain.	This alternative would not likely have an effect to slope stability. There would be no treatments on or adjacent to dormant landslide terrain.	This alternative would not likely have an effect to slope stability. There would be a slight potential for debris flow 5-10 years after juniper is cut or killed by fire. There is a low potential for debris flows to reach streams. This alternative would treat less than 200 acres of dormant landslide terrain. The likelihood of such an occurrence is small.	This alternative would not likely have an effect to slope stability. There would be a slight potential for debris flow 5-10 years after juniper is cut or killed by fire. There is a low potential for debris flows to reach streams. This alternative would treat less than 200 acres of dormant landslide terrain. The likelihood of such an occurrence is small.
Recreation	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. This alternative would not have a measurable effect on visual resources. Juniper expansion would continue under this alternative. In time vistas available now along trails could be eliminated. Juniper expansion would also increase the risk of severe high intensity wildfires, which have the possibility of destroying developed recreation facilities.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. This alternative would not have a measurable effect on visual resources. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than 4 percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. With this alternative there would be unsightly un-vegetated areas around livestock water troughs and corrals. Juniper expansion would continue under this alternative. In time vistas available now along trails could be eliminated. Juniper expansion would also increase the risk of severe high intensity wildfires that have the possibility of destroying developed recreation facilities.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. Proposed vegetation management activities such as chainsaw use, prescribed fire, and mechanical treatments would provide short-term increases in noise and dust experienced by recreationists. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than 4 percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. Post fire effects include smoke (for a few days at the most), black trees, and denuded vegetation. These effects are short-term. Natural barriers to off road use provided by existing juniper could be lost as juniper density projects remove trees.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. Proposed vegetation management activities such as chainsaw use, prescribed fire, and mechanical treatments would provide short-term increases in noise and dust experienced by recreationists. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than 4 percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. Post fire effects include smoke (for a few days at the most), black trees, and denuded vegetation. These effects are short-term. Natural barriers to off road use provided by existing juniper could be lost as juniper density projects remove trees.

Table Summary-3 Summary of Expected Wildlife Effects by Alternative

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
		HABITAT SPECIALISTS		
American Goldfinch	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase, but not as much as in Alternatives A, B, or D.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase.
Belding's Ground Squirrel	As juniper density increases habitat for this species would decline significantly, long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased Long term.	As juniper density increases, habitat for this species would decline significantly, long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Bighorn Sheep **Proposed for reintroduction to the Grassland.**	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term. No risk of disease transmission between bighorn sheep and domestic sheep.	Possible increased risk of disease transmission between bighorn sheep and domestic sheep. Habitat quality is not expected to increase from present conditions.	Changes proposed in grazing would improve habitat quality for this species Possible increased risk of disease transmission between bighorn sheep and domestic sheep. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Changes proposed in grazing would improve habitat quality for this species. No risk of disease transmission between bighorn sheep and domestic sheep while the Canadian Bench Allotment remains vacant. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Brown Creeper	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as pine stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as pine stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
California Quail	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Gray Squirrel	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This squirrel is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This squirrel is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase.
Horned Lark	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			provides increased quality of habitat through more conservative grazing.	
Least Chipmunk	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Mountain Quail	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
				species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Pine Grosbeak	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
Pygmy Nuthatch	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
POTENTIAL, ENDANGERED, THREATENED, AND SENSITIVE SPECIES				
Northern Bald Eagle	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
American Peregrine Falcon **Not currently present on the CRNG.**	No Effects	No Effects	No Effects	No Effects
Greater Sage Grouse **Extirpated from CRNG in 1950s.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Tricolored Blackbird **Not currently present on the CRNG.**	No Effects	No Effects	No Effects	No Effects
Gray Flycatcher	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Grazing has a negligible effect on these birds. Long term risk of large wildfires is increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Grazing has a negligible effect on these birds. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase foraging habitat from unsuitable to suitable in five to fifteen years. Grazing has a negligible effect on these birds. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase foraging habitat from unsuitable to suitable in five to fifteen years. Grazing has a negligible effect on these birds.
Pygmy Rabbit **Possibly one colony on CRNG**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Bufflehead	No Effects	No Effects	No Effects	No Effects
Neotropical Migratory Birds (Focal Species)				
Bullock's Oriole	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Black-throated Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
				This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Brewer's Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Lark Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through grazing.	than in Alternative B.
Lewis' Woodpecker	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	There are no treatments planned in this bird's habitat. There would be no change in habitat.	There are no treatments planned in this bird's habitat. There would be no change in habitat.
Loggerhead Shrike	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality for adult birds increases. Open habitat for young birds would decrease. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Quality and quantity of habitat is not expected to change from what exists today.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Thinning closed canopy stands would also increase habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would provide a good mosaic for these birds. Adults would have areas with cover while young birds would have open areas for foraging. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, and a mosaic of habitats created through grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Thinning closed canopy stands would also increase habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would provide a good mosaic for these birds. Adults would have areas with cover while young birds would have open areas for foraging. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Red-naped Sapsucker	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Sage Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Sage Thrasher	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
Sharp-tailed Grouse **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Yellow Warbler	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Yellow-breasted Chat	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Willow Flycatcher	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
RAPTORS				
Burrowing Owl **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through grazing.	this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Ferruginous Hawk **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover for their prey species would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover for their prey species would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Flammulated Owl	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			much as in Alternatives A, B or D.	
Golden Eagle	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
Northern Goshawk	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
Prairie Falcon	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
Western Screech Owl	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
BIG GAME				
Pronghorn	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Mule Deer	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of bitterbrush habitat for this species in the short-term, but would increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of bitterbrush habitat for this species in the short-term, but would increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
MANAGEMENT INDICATOR SPECIES				
Pileated Woodpecker	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.
White-headed Woodpecker	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	There are no treatments planned in this bird's habitat. There would be no change in habitat.	There are no treatments planned in this bird's habitat. There would be no change in habitat.
Northern Flicker	Pine and juniper trees would continue to increase in size, which would be beneficial to this species short term. Long term however, stands would grow into closed canopy conditions, decreasing habitat for this species.	Pine and juniper trees would continue to increase in size, which would be beneficial to this species short term. Long term however, stands would grow into closed canopy conditions, decreasing habitat for this species.	This bird is not affected by seeding or grazing. Juniper thinning treatments would create open stand conditions, which these birds prefer. This alternative creates the most habitat long and short term for these birds.	This bird is not affected by seeding or grazing. Juniper thinning treatments would create open stand conditions, which these birds prefer.

CHAPTER 1 - Purpose and Need

1.1 Document Standards

The Forest Service has prepared this Final Environmental Impact Statement (FEIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

The document is organized into the following parts:

- **Introduction:**
  - This section includes information on the history of the Grassland, management direction, the purpose of, and need for the project, and the agency's proposed action for achieving that purpose and need, and the decisions to be made. This section also details how the Forest Service informed the public of the proposal and how the public responded and the issues raised during that process.

- **Alternative Descriptions**, **including the Proposed Action:**
  - This section provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on issues raised by the public and other agencies, as well as from within the Forest Service. This discussion also includes project design criteria. Finally, this section provides summary tables describing how the alternatives meet the purpose and needs and also of the environmental consequences associated with each alternative.

- **Affected Environment and Environmental Consequences:**
  - This section provides a detailed description of the affected resources within the project area. The existing conditions of the affected resources are considered to be the baseline, against which the effects of each alternative are measured. It also describes the environmental effects of implementing the proposed action and other alternatives. The analysis is organized by resource area. Within each section, the affected environment is described first. This description is followed by the effects of the No Action Alternative that provides an additional reference for evaluation and comparison of the other alternatives. The description of the effects of these other alternatives completes the effects discussion for each resource area.

- **Agencies and Persons Consulted:**
  - This section provides a list of preparers and agencies consulted during the development of the environmental assessment.

- **Appendices:**
  - The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Crooked River National Grassland office in Madras, Oregon.

1.2 Background

1.2.1 Project Location

The Crooked River National Grassland (Grassland) is located entirely within the boundaries of Jefferson County in central Oregon (Map 1 - Vicinity Map). There are approximately 173,629 acres incorporated within the administrative boundaries of the Grassland (LRMP, 1989, page 1-4). This includes 111,571 acres under the management and administration of the Forest Service. The remainder of the lands within the Grassland administrative boundary are either privately owned or under the administration of the Bureau of Land Management (BLM), the State of Oregon, or Jefferson County.

US Highway 97 traverses the Grassland from north to south and divides it into two approximately equally sized pieces. US Highway 26 traverses the eastern portion of the Grassland from northwest to southeast between the cities of Madras and Prineville.

West of Highway 97, the terrain is characterized by high plateaus interrupted by the steep canyons of the Deschutes River and its tributaries. East of the Highway, the terrain consists of rolling hills and buttes. Elevations range from 2,241 feet at Madras to 5,108 feet at the top of Gray Butte.

The Grassland lies within the Upper Deschutes, Deschutes/Round Butte, and Lower Crooked River watersheds of the Deschutes River basin. Over the past 20 years, over 90 percent of the riparian areas on the Grassland have been fenced to exclude livestock grazing.

1.2.2 General History of the Crooked River National Grassland

Initial settlement in the area of the Grassland began in the mid-1800s. Trout Creek, east of present day Madras, saw the first settlement of the Grassland area in 1862 when cattle were brought over the Cascades from Lane County via the McKenzie Pass. Settlement of Upper Willow Creek began in 1863. Ranching and livestock grazing of both sheep and cattle dominated the area along with some mineral exploration and limited mining. In 1870, ranchers moved into the Ashwood area just as the first settlers were arriving in the Haystack Butte area. In 1888, the first homestead was patented on the current site of the town of Madras.

The promise of future water and irrigation projects encouraged additional settlement. The Homestead Act, Desert Land Act, Enlarged Homestead Act, and Stock-Raising Homestead Act permitted private acquisition of public domain lands. As a result, many town sites and post offices were developed including: Grizzly, Lamonta, Opal City, Geneva, and Grandview. The most intense period of homestead settlement occurred between 1900 and 1925. For instance, during the early 1900s the town of Grizzly supported a school with more than 40 students and boasted a community of 150 families.

Although the first livestock were primarily cattle, sheep soon became dominant. By 1895, it was estimated that 150,000 head of sheep headquartered in what is now Jefferson County. In 1930, the shift changed from sheep back to cattle. Today there are relatively few sheep in this part of the county (Hay Creek Ranch still grazes approximately 3,000 ewes).

Most of the homesteaders on the Grassland were dryland farmers. They primarily grew grains. In 1911, a considerable amount of grazing land was converted to cropland by these homesteaders.

Settlement flourished for a time, but drought conditions, lack of water, and the Depression took its toll on the early settlers. A series of crop failures and near dust-bowl conditions forced many homesteaders into bankruptcy during the 1920s and 1930s. By 1934, fewer than 50 families remained out of the nearly 700 that had existed some three decades earlier. Jefferson County residents petitioned the Roosevelt administration for assistance at that time.

In 1937, the Resettlement Administration purchased approximately 92,000 acres under the authority of that years' Bankhead-Jones Farm Tenant Act (BJFTA). During the same year, the Resettlement Administration also acquired 13,000 acres of public domain lands and an additional 945 acres through land exchanges. These lands were designated as Central Oregon Land Utilization Project (LUP) lands and represented the initial lands included in what is now the Grassland.

In 1938, management responsibility for the LUP lands was transferred to the Soil Conservation Service (SCS). Intensive improvement and development activities began almost immediately on these LUP lands. New roads, buildings, transportation facilities, and fences were built; flood and erosion control strategies were adopted; grass and trees were planted; water storage facilities were constructed; and stream channels were widened and cleaned.

It was during this period that efforts to reseed and reclaim crop and pasture land began. When these efforts were halted in the 1980s, approximately 65,000 acres of previously farmed lands had been seeded to crested wheatgrass or beardless bluebunch wheatgrass for the purpose of soil stabilization and watershed protection.

In 1954, management responsibility was transferred to the USDA Forest Service.

The Crooked River National Grassland was officially designated in 1960. The Grassland currently manages 111,571 acres of publicly owned lands. All National Grasslands properties, including the Crooked River National Grassland, were acquired for the purpose of soil and water conservation with demonstrational livestock grazing as the stated public use (Obermiller 2000). The regulations governing administration of the National Grasslands (36 CFR § 213) specifically provide that the regulations applicable to National Forests also apply to the National Grasslands, except when inconsistent with the BJFTA.

Of the approximately 173,629 acres of land of all ownership types within the Grassland administrative boundaries, approximately 119,763 acres of lands of mixed ownership are included in the existing 23 grazing allotments. This mix of Grassland, BLM, state, and private lands includes 102,938 acres of Grassland lands, 15,740 acres of private lands, 727 acres of BLM lands, and 358 acres of state lands. An additional 8,633 acres of Grassland lands are not located within existing allotments and are not open to grazing.

The 23 existing allotments are grazed under a permit issued to a single permittee, the Gray Butte Grazing Association (GBGA). The GBGA, as the permittee, assigns and administers grazing permits to its 20 members. Due to the intermixed landownership pattern within these allotments, other ownership acres have historically been grazed in combination with Grassland lands. The GBGA permittee on each allotment pays a fee to each landowner on whose land the GBGA permittee grazes. Fees paid to other landowners are similar to the fees paid to the Grassland.

The 20 members of the GBGA currently graze approximately 2,500 head of livestock on the 23 allotments.

1.2.3 Crooked River National Grassland Sagebrush Habitat Restoration Initiative

This internal document establishes a long-term vision for managing the Grassland (on file at the Crooked River National Grassland office in Madras). The document identifies three areas of focus:

- To restore both the flora and fauna of land that no longer supports sagebrush steppe vegetation communities; comprised of a high proportion of native plant species.
- To restore hydrologic function to the areas watercourses, and to control invasive plant species.

- The overall goal from this document is to rehabilitate sagebrush steppe habitats so that an increased probability of long-term viability for native plant and animal species is gained.

1.2.4 Crooked River National Grassland Watershed Analysis

In March 2003, a watershed analysis was completed that covered the entire Grassland. The analysis included the following subwatersheds: Mud Springs Creek, Deschutes South, Willow Creek, Lower Crooked River Valley, Crooked River Grasslands, Lower Metolius, Steelhead, Lake Billy Chinook, and Whychus. This analysis resulted in the following recommendations:

- Adding a rest pasture to some of the existing grazing systems would increase plant vigor and the accumulation of organic matter needed to advance succession.
- Re-aligning the pasture fence in the Mud Springs pasture would facilitate improved livestock distribution and provide relief from grazing to the historical floodplain.
- Rehabilitating approximately 10,000 acres of stagnated crested wheatgrass seedings located primarily within the Willow Creek and Lower Crooked River Valley subwatersheds. This would be accomplished using native plant species and/or appropriate cultivars of native species and non-native plant materials when re-seeding. Rehabilitation of compacted soils associated with farming, homesteading, and grazing. The watershed analysis recommended the use of appropriate tools (tilling, seeding, etc.) to reduce compaction levels and allow succession to proceed.
- Returning western juniper density and distribution pre-settlement levels (20-30 percent of Grassland, VEMG). Thin juniper in order to set succession back to early seral conditions or to encourage movement from mid-seral pole sized juniper stands to late seral small to large timber sized juniper stands on 50,000 acres of the Grassland over the next ten years. The purpose of this recommendation is to maintain the sagebrush steppe plant associations with a diversity of seral conditions in order to provide wildlife habitats for the full compliment of species known to use the Grassland. Use appropriate tools such as chainsaw cutting and prescribed fire.
- Closing the Peninsula, Clevenger, and Goldmine/Falls Allotments to livestock grazing.
- Discontinuing re-grazing early grazed pastures during the same growing/grazing season (except the Haystack Butte Allotment) to increase the accumulation of organic matter needed to advance succession, encouraging re-establishment of native plant species, and to provide cover necessary for ground nesting birds.

1.3 Management Direction

1.3.1 Legal Status for Management

1.3.1.1 Forest Reserves Act of March 3, 1891.

Certain forest reserves were selected from remaining federal lands and placed under the control of the Department of the Interior (DOI).

1.3.1.2 Organic Act of 1897

It gave the Secretary of the Department of the Interior the general power to regulate the forest reserves. The Department began limiting grazing on the forest reserves, and in 1901, installed a permit system regulating all grazing on federal lands.

1.3.1.3 Transfer Act of 1905

It transferred the administration of the grazing on the forest reserves to the Department of Agriculture's newly created Forest Service. Fees for grazing permits on the forest reserves were

imposed for the first time in 1906. The Supreme Court in United States v. Grimaud in 1911 upheld the imposition of fees.

The Supreme Court addressed the use of Federal lands for grazing in the case Buford v. Houtz in 1890 and determined that, where suitable, the government could not deny grazing.

1.3.1.4 Light v. Untied States 1911

This case determined that grazing does not confer a right. Other similar cases demonstrated that grazing on National Forest is clearly a privilege not a right.

1.3.1.5 Bankhead-Jones Farm Tenant Act (BJFTA) 1937

The Bankhead-Jones Farm Tenant Act (BJFTA) of 1937 (as amended) is the guiding act for the management of the Grassland. It gave organic authority to the Farm Security Administration (today's Farm Credit System) for management of Land Utilization Project (LUP) lands.

Section 31 of the BJFTA states that *"The Secretary is authorized and directed to develop a program of land conservation and land utilization, in order thereby to correct maladjustments in land use, and thus assist in controlling soil erosion, reforestation, preserving natural resources, protecting fish and wildlife, developing and protecting recreational facilities, mitigating floods, preventing impairment of dams and reservoirs, developing energy resources, conserving surface and subsurface moisture, protecting the watersheds of navigatable streams, and protecting the public lands, health, safety, and welfare, but not to build industrial parks or establish private industrial or commercial enterprises."* (Range Specialist Report, page 5).

A clause in the Forest and Rangeland Renewable Resources Planning Act of 1974 (16 U.S.C. 1609(a) incorporated these lands into the National Forest System. However, the unrepealed Title III of the BJFTA remains the controlling statutory authority. Such acquired lands "remain in class of lands acquired for special uses, such as parks, national monuments, and the like" (Rawson v. United States, 225 F2d 855 (9th Cir. 1955)).

1.3.1.6 Taylor Grazing Act 1934 & Granger-Thye Act 1950

In 1934, Congress enacted the Taylor Grazing Act authorizing grazing districts and issuance of ten-year permits. The Taylor Grazing Act did not apply directly to grazing within the national forests as it directly applied to the Department of Interior, Bureau of Land Management lands but was explicit by Congress concerning the legal interests generated by grazing activities on federal lands. The Act reiterated that grazing was not a right.

The Granger-Thye Act specifically authorized the issuance by the Forest Service of 10-year grazing permits on national forests.

1.3.1.7 Clean Water Act (Federal Water Pollution Control Act Amendments of 1972)

The goals and objectives of this act are to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" and to have "water quality which provides for protection and propagation of fish, shellfish and wildlife, and provides for recreation in and on the water."

Section 209 (Basin Planning) requires regulation of non-point sources of pollution using water quality management plans and basin planning. The use of Best Management Practices (BMPs) is the backbone of the regulatory program for non-point source control. Stubble height in pastures is closely monitored and used as a surrogate for hydraulic roughness. If minimum stubble heights are

being met then it is assumed that there is sufficient roughness to trap sediment that is mobilized during periods of surface runoff.

1.3.1.8 Endangered Species Act of 1973 (P.L. 93-205, 87 Stat. 884, as amended; 16 U.S.C. 1531-1536, 1538-1540) (USDA, 1993)

The Endangered Species Act has the following purposes:

- To provide a means whereby the ecosystems upon which endangered species and threatened species may be conserved.
- To provide a program for the conservation of such endangered and threatened species.
- It is the policy of the Endangered Species Act and Congress that all Federal agencies: shall cooperate with State and local agencies, shall seek to conserve endangered and threatened species, and shall use their authorities in furtherance of the purpose of this Act.

1.3.1.9 National Forest Management Act, 1976 (NFMA)

This act requires certain management standards be met during activities on the National Forests and Grasslands. The act also provides for the integration of planning for National Forests and Grasslands, including the planning for timber, range, fish, wildlife, water, wilderness, and recreation resources.

1.3.1.10 Clean Air Act of 1977

This act provides the Oregon Department of Environmental Quality with the authority to assure compliance with certain air quality standards. In 1994, the U.S. Forest Service, in cooperation with the Oregon Department of Environmental Quality, the Oregon Department of Forestry, and the Bureau of Land Management, signed a Memorandum of Understanding (MOU) to establish a framework for implementing and air quality program in Northeast Oregon.

1.3.1.11 Federal Land Policy and Management Act 1978 (FLPMA)

This act provides basic guidelines to administering permits and leases. It states that grazing is authorized only when it is consistent with general public interest.

Under FLPMA the Secretary of Agriculture may include, within grazing permits, whatever terms and conditions he "*deems appropriate and consistent with the governing law*," and may "*cancel, suspend, or modify a grazing permit*."

"*Cancellation or modification may result from resource conditions, for non-use, violations of numbers, tagging and kind of livestock, changes in qualifications…*" In addition, the permit, by its terms, is nontransferable and not assignable.

Congress granted the Department of Agriculture the authority to regulate grazing on the national forests and this authority has been upheld in numerous court cases.

1.3.1.12 Rescissions Act, 1995

This act contained three provisions as follows:

- <u>A schedule for NEPA Compliance.</u> Each National Forest System unit shall establish and adhere to a schedule for the completion of National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) analysis and decisions on all allotments within the National Forest System unit for which NEPA analysis is needed. The schedule shall provide that not more than 20 percent of the allotments shall undergo NEPA analysis and decisions through fiscal year 1996.
- <u>Re-issuance Pending NEPA Compliance.</u> Notwithstanding any other law, term grazing permits which expire or are waived before the NEPA analysis and decision pursuant to the

schedule developed by individual Forest Service System units, shall be issued on the same terms and conditions and for the full term of the expired or waived permit. Upon completion of the scheduled NEPA analysis and decision for the allotment, the terms and conditions [Page 109 STAT. 213] of existing grazing permits may be modified or re-issued, if necessary to conform to such NEPA analysis.

- Expired Permits. This section shall only apply if a new term grazing permit has not been issued to replace an expired or waived term grazing permit solely because the analysis required by NEPA and other applicable laws has not been completed and also shall include permits that expired or were waived in 1994 and 1995 before the date of enactment of this Act (7/27/1995).

1.3.1.13 Executive Order 13186 of January 10, 2001. Sec. 3 (6)

In 2001 President Clinton signed Executive Order 13186 Sec. 3 (6) that states: "ensure that environmental analyses of Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern."

1.3.1.14 The Land and Resource Management Plan, Part 2, Crooked River National Grassland (LRMP, 1989)

This document contains the guiding direction for management of the Crooked River National Grassland. It identifies goals, objectives, and desired future conditions. It also identifies management areas with different resource emphases. It provides direction for managing land allocations, including the standards and guidelines for land management

1.3.2 LRMP Desired Future Condition by Management Area

A Management Area (MA) is composed of lands with similar capabilities managed under a common prescription with a common set of goals and objectives. The lands may or may not be contiguous.

All areas of the Grassland are managed under Grassland-wide standards and guidelines and broader use principles directed by laws, regulations, and policies. Each management area is also managed with additional management area specific standards and guidelines (LRMP, 1989, pages 4-59 through 4-128).

The Grassland is divided into 16 different management areas (LRMP, 1989, pages 4-21 through 4-57). The following MAs are affected by the proposed actions. The analysis will assess the effect of actions on the MAs. These MAs have established desired future conditions set in the LRMP. Table 1-1 (below) lists the primary management areas associated with the proposed action. The Grassland has other management areas not listed here as they are outside of the proposed action and or are not affected by the proposed action.

Table 1-1 Affected Management Areas (LRMP 1989), Crooked River National Grassland

Affected Management Areas	Acres
MA-G1 Antelope Winter Range	22,700
MA-G2 Metolius Deer Winter Range	12,740
MA-G3 General Forage	59,440
MA-G8 Squaw Creek	7,840

1.3.2.1 MA-G1 Antelope Winter Range - (LRMP Page 4-23)

Antelope winter range will generally consist of open grassland with shrub heights at or below 24 inches, but definitely not over 30 inches in height.

The area would have an abundance of fall green up left for antelope winter use.

1.3.2.2 MA-G2 Metolius Deer Winter Range - (LRMP Page 4-23)

The forage/cover ratio will be at the optimum level of 60/40 wherever that is possible and will be well distributed. A vigorous shrub component would be present.

Livestock will be used as a management tool to maintain winter deer forage in a highly palatable and nutritious condition.

1.3.2.3 MA-G3 General Forage (LRMP Page 4-25)

The management area will contain the natural composition and cover values of native grasses, sedges, forbs, and palatable shrubs. Undesirable forage plants, such as sagebrush and juniper which decrease range productivity will be managed using the tools of fire and livestock to reduce their competition while keeping with multiple use objectives.

Proper stocking levels and distribution of livestock will be employed to effectively utilize production without adversely affecting plant communities over time.

Some crested wheatgrass pastures will be used as early season pastures, and as such will be managed to maintain the crested wheatgrass. Other crested wheatgrass pastures will be proceeding through natural succession toward re-establishment of native plant species.

1.3.2.4 MA-G8 Squaw Creek (LRMP Page 4-32)

Except for FR 6360 the area will be devoid of motor vehicles. The vegetation will continue to be lush along the creek, providing excellent riparian habitat. Recreational use and livestock use will occur, but the area will appear natural. Wildlife and fish species indigenous to the area will continue to be evident at levels consistent with available habitat. Fire occurrence will be evident where prescribed fire and wildfire from natural or human-caused starts occur.

1.4 Purpose and Need for Action

In March 2003, a watershed analysis was completed that covered the entire Grassland. This analysis provided the basis for the purposes and needs for action in this FEIS.

1.4.1 Purposes

The purposes of this project are to:

- Continue and/or initiate the restoration and/or rehabilitation of vegetation to pre-settlement conditions as defined by the historic range of variability as calculated in the Ochoco National Forest Viable Ecosystems Management Guide (USDA 1994).
- Meet the requirements of Section 504 of the 1995 Rescission Act requiring NEPA analysis and decisions for all grazing allotments by 2011.
- Reauthorize grazing on capable and suitable lands.

1.4.2 Needs

1.4.2.1 There is a need for the density and distribution of post settlement western juniper to more closely reflect the levels within the historic range of variability, and for the maintenance of existing sagebrush steppe sites where juniper is encroaching.

Historically, approximately twenty to thirty percent of the juniper woodland and steppe plant association group's (PAG) acres of the Grassland would have had a component of western juniper. Today western juniper exists on approximately 90 percent (approximately 91,000 acres) of the Grassland. Although juniper is a native species on the Grassland, it has expanded its distribution and density over the past 100 years. This change has occurred in the absence of pre-settlement fire regimes (USDA, Forest Service, Viable, 1994 and Grassland personnel observations, combined with NRCS Ecological Site Inventory 2001 (USDA NRCS, 2001)).

Western juniper has increased in distribution and density on many of the approximately 64,000 acres of abandoned farmland that were subsequently seeded primarily to crested wheatgrass and beardless bluebunch wheatgrass.

Likewise, juniper has also increased in distribution and density on many of the approximately 55,500 acres of native plant associations on the Grassland. These associations include western juniper/sagebrush/bunchgrass and sagebrush/bunchgrass associations. These native sites were never farmed.

As juniper has become the dominant plant species on what was sagebrush/bunchgrass sites, the following changes have occurred:

- The loss of mid-sized shrubs such as sagebrush, bitterbrush, and rabbitbrush.
- The conversion from shade intolerant grasses to shade tolerant grasses (i.e., from bluebunch wheatgrass to Idaho fescue).
- On many sites as cover type conversion occurred from sagebrush steppe to juniper woodland, the understory has converted from deep-rooted native perennial grasses and forbs to Sandberg bluegrass (shallow-rooted native grass) and annual forbs. This change constitutes a loss of plant species diversity (Condition and Trend transects and personal observation of Grassland personnel).

Old-growth juniper existed historically on the Grassland. It is estimated that old growth or pre-settlement juniper primarily existed on the rocky ridge tops and in other areas where wildfire naturally would not spread. Most of the standing old-growth juniper that existed prior to settlement was cut and used by the settlers for fences, firewood, along with other uses. Today we have occasional individual old trees scattered around the Grassland and one identifiable old-growth stand located on the south slope of Gray Butte. These biological old growth trees and stands are protected in the project design criteria of the proposed actions.

There is a need to move some of the existing juniper stands toward old growth, pre-settlement characteristics by thinning selected mid-sized juniper stands to increase growth rates of leave trees. Thinning those stands would increase tree growth resulting in larger sized trees with old growth characteristics faster than unthinned stands. Thinning would also reduce juniper stocking levels to those present prior to Euro-American settlement. Thinning would help move juniper stocking levels and distribution towards the historic range of variability (HRV). Developing old growth characteristics in residual juniper stands would help to maintain and/or enhance habitat for the common flicker.

There is a need to maintain existing sagebrush steppe sites where juniper is encroaching. Mosaics of early to mid successional stands of sagebrush and/or bitterbrush and grass stands characterize these sites. Juniper trees that are establishing in these sites are generally young and less than ten feet tall. These trees are growing through and above the shrub layer, and are scattered across the landscape. Approximately 1,100 acres of these types of sites are estimated to move from earlier seral shrub/grass dominated vegetation to juniper dominated sites annually.

Sagebrush steppe habitat dependent wildlife species such as the sage sparrow and sage thrasher are lost when sites progress successionally from sagebrush steppe to juniper woodland. Winter forage for mule deer decreases when juniper out-competes antelope bitterbrush. Antelope prefer "open spaces" that allow them to see predators. This habitat is lost with increasing juniper numbers and densities. The vision statement (see Section 1.2.3) encourages the restoration of both flora and fauna associated with sagebrush steppe ecosystems.

The Grassland Watershed Analysis completed in 2001 (USDA 2003, page 1-4) recommends to "Return western juniper density and coverage to the Historical Range of Variability". Other resources that can be affected by juniper expansion are:

> "*Increasing juniper density and size has the apparent effect of reducing understory plant cover and productivity, with forage grasses being the most severely reduced. Also, water infiltration rates are reduced while sediment yield is increased. Understory plants may be negatively affected by juniper induced reduction in light, soil moisture, and soil nutrients and by allelopathic factors (plant toxins) in juniper litter and root exudates*" (Eddleman 1983).
>
> "*Western juniper encroachment into shrub-steppe communities can have a significant effect on the water cycle. Sites where juniper encroachment fosters biomass concentration at the tree with increasing amounts of bare ground in the interspaces become drier from decreased infiltration of precipitation into the soil profile and increased surface flows, which quickly carry water off-site*." (Buckhouse 1999).

Forage quality and quantity for domestic livestock as well as other grass foraging wildlife such as elk is lost as juniper increases and grass decreases. Browse quality and quantity for deer (and other species that browse shrubs) also decreases as juniper densities increase.

1.4.2.2 There is a need for succession to advance on some of the seeded sites (less than 10,000 acres) beyond Sandberg bluegrass dominated sites toward HRV plant associations characterized by deep-rooted native bunchgrasses and forbs under sagebrush and bitterbrush (with a diversity of age classes of sagebrush).

Approximately 64,000 acres of the Grassland were dryland farmed for approximately 40 years during the late 1800s and early 1900s. Between 1935 and 1965, sites were seeded to non-native plant species such as crested wheatgrass and/or cultivars of native plants such as beardless bluebunch wheatgrass, commonly known as Whitmar.

A range of ecological conditions currently exists on these seeded sites. Some sites have moved from a monoculture of crested wheatgrass toward HRV with native plant associations characterized by sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue, bottlebrush squirreltail, Sandberg bluegrass, and various native forbs. Others sites exhibit slow or no progress (ecological succession) toward native plant associations, with rabbitbrush, crested wheatgrass, and Sandberg's bluegrass (a shallow-rooted native grass) continuing to dominate those plant communities. There is a need to promote the advancement of ecological succession on those sites.

On the Grassland, native grass species have proven to be better adapted to local site conditions than introduced grass species such as crested wheatgrass. This has been documented over the past 45 years by plant composition changes noted in permanent Condition and Trend transect records located on the Grassland. Generally, over time (past 50 years) the crested wheatgrass seedings planted during the 1940s and 1950s have progressed successionally from solid stands of crested wheatgrass to more complex sites that include native grasses and forbs (FEIS, Chapter 3, Section 3.3.2.1, Table 3-11).

There is a need to improve big game forage and browse by rehabilitating non-native, seeded grass, and shrub sites by seeding desirable species.

Native grass species are the most desirable forage species for domestic livestock on the Grassland. Natives have longer growing seasons, are better adapted to local site conditions, and remain more palatable in the fall than crested wheatgrass.

Moving to and/or maintaining sagebrush/bunchgrass communities in the juniper plant association groups (PAGs) within HRV would aid in the protection and enhancement of habitat for species dependant upon those habitats such as the sage thrasher and sage sparrow.

1.4.2.3 There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area.

Statewide in Oregon there are an estimated 1,360,000 cattle and calves. In 2002, livestock sales comprised 13 percent of all agricultural sales and generated $422,986,000. Livestock sales are second only to greenhouse and nursery production as leaders in state agricultural production (Oregon Department of Agriculture 2002).

Jefferson County, the location of the Grassland, is the ranching center for the tri-county area of Crook, Deschutes, and Jefferson County. It provides livestock marketing and most of the agricultural services in the tri-county area, services generally not present in either Crook or Deschutes Counties. In addition to cattle and calves, Jefferson County also produces grass and legume seed, and field crops.

Crop sales in Jefferson County for 2003 totaled $43,337,000. Livestock sales were 27 percent or $11,283,000 of that total. The Oregon State University Extension Service estimates that Jefferson County has a herd of approximately 11,000 cattle. Grass and legume seed sales are second (16 percent) in agricultural sales to livestock. Many of the livestock grazing permittees from the Grassland also produce grass and legume seed (Oregon Department of Agriculture 2003).

Jefferson County is heavily dependent on agriculture. Most of the Grassland livestock permittees farm and/or ranch in Jefferson County near/or adjacent to the Grassland. These Grassland permittees are fully involved in agriculture as a business and a lifestyle. The Grassland provides forage for approximately 20 permittees for four to seven months annually.

All three counties rely on Jefferson County for livestock sales, seed production, and a large portion of the agricultural service industry.

There is an economic demand for the forage produced on the Grassland. This demand is demonstrated by the continual demand and stocking of most grazing allotments on the Grassland over the past fifty years.

The Grassland Land and Resource Management Plan (LRMP 1989), as well as Forest Service policy, allows for and expects livestock grazing on suitable land.

1.4.2.4 There is a need for a diversity of grass stubble (leaf length) heights (up to 15 inches or higher) at the end of the grazing season. On some of the historically homesteaded and farmed sites organic matter is lacking in and on the soil. Leaving sufficient stubble at the end of the grazing season will aid in the accumulation of organic matter which will aid in the establishment of deep-rooted native grass species. A range of stubble heights would provide habitat for ground nesting birds such as the California quail, western meadowlark, horned lark, and the burrowing owl.

Most of the grazing allotments on the Grassland have used modified deferred rotation grazing systems during the past decades. Most allotments have six to nine pastures. Each allotment has one herd of cattle that moves through the pastures with the objective of grazing half of the annual growth (50 percent utilization). On many allotments, re-grazing the first grazed pasture is part of the existing plan. Re-grazing is designed to capture the re-growth that occurs after the pasture has been grazed early in the season.

The practice of re-grazing early use pastures produces evenly used pastures but does not generally leave stubble heights over four inches. Although livestock distribution and use is even, habitat for ground nesting birds is greatly reduced. Many ground dwelling birds need taller (greater than six inches) grass that provides hiding cover for nests and over wintering habitat as well as hiding cover from predators.

Discontinuing the re-graze option and establishing rest pastures where appropriate would result in a range of stubble heights of three to 15 inches or more, across each allotment at the end of the grazing season. This would, in turn, result in greater habitat diversity across the Grassland and provide more favorable habitat conditions for a wide array of wildlife species that depend upon taller grass stubble heights.

Discontinuing the re-graze option would also aid in the recruitment of deep-rooted native perennial grasses as more organic matter would be available for the development of soil horizons which could aid in such establishment.

1.4.2.5 There is a need to close (discontinue) livestock grazing on three allotments and one pasture of another allotment.

1.4.2.5.1 Peninsula Allotment

There is a need to close this allotment to grazing for the following reasons:

- Downward ecological trends have been measured on Condition and Trend Clusters 1, 2, and 5.
- The allotment has been in non-use status for the past two seasons.
- All range improvements including fences, pipelines, and stock tanks are currently in disrepair.
- This allotment is located on a peninsula with a single entry point at the south end of the allotment. Access to Forest Service lands requires travel through several miles of the Crooked River Ranch Subdivision, a private residential development south of the allotment. Residents of the subdivision use the peninsula area for a variety of recreational activities. This situation leads to gates being left open and damage to assets such as the livestock water system. While the conflicts are a nuisance to the permittee now it is expected that the intensity of the conflicts will increase in the future.

- Two private in-holdings within the allotment are currently being developed into residential areas. Presently no fences separate the private land from the Grassland owned land.
- Construction of a new fence in 2003 to separate a hiking trail from livestock use and to keep vehicle use away from the northern most point of the peninsula separated the north part of the allotment from the remainder of the allotment. The effect was a reduction of the size of the north pasture, reducing the carrying capacity of the allotment.
- Increasing recreation use and the loss of open space associated with the development of the private in-holdings, the Crooked River Ranch Subdivision, and Cove Palisades State Park are expected to result in increasing conflicts between any permittee on the allotment and other users of the area and adjacent properties.

1.4.2.5.2 Clevenger and Goldmine/Falls Allotments

There is a need to close these allotments to grazing for the following reasons:

- Both allotments have been vacant for more than ten years. There has been no demand for either one.
- In the past, these allotments were grazed with adjacent private land. This option is no longer possible. Because of this, grazing would require extensive fence construction and the development of watering facilities in each allotment.
- Both are small in area, approximately 638 and 720 acres. Each has limited carrying capacities (in animal unit months (AUMs), 41 and 54 AUMs respectively.
- Both are partially located within the boundaries of the Middle Deschutes Wild and Scenic River corridor. Presently they are poorly and incompletely fenced and lack livestock drinking water away from the river. Grazing is not permitted between the "benches" (within the canyon), as per the Middle Deschutes and Lower Crooked River Wild and Scenic Management Plan.

1.4.2.5.3 Squaw Creek Pasture of the Holmes-Squaw Creek Allotment

There is a need to close this pasture to grazing for the following reason:

- This pasture is within a proposed Scenic River Corridor. The Grassland LRMP states "Livestock grazing will not be allowed in the river corridor."
- Sheep originally grazed this pasture. Many miles of fence would be required to change it to a cattle pasture to adhere to the LRMP guidelines for this management area.
- This pasture has been vacant for a number of years.
- Squaw creek is utilized by bull trout, a threatened fish species. It is also historic and essential fish habitat for steelhead trout. According to the project design criteria in the Biological Assessment (USDA 2003), "Livestock will be excluded from streams with steelhead spawning habitat from February 15 to July 15th."
- This pasture is within the Metolius Mule Deer Winter Range. Project design criteria in this document suggest "Season of use for domestic livestock would generally not be allowed after August 1 in order to eliminate potential conflicts between livestock and mule deer needs." (FEIS, Chapter 2, Section 2.4.3)

1.5 Proposed Action

Table 1-2 (below) displays the proposed action vegetation treatments and grazing allocation.

Table 1-2 Alternative C - Proposed Action – Vegetation Treatments/Grazing Disposition

Vegetation Treatments/Grazing Disposition	Proposed Action Acres
Acres of Juniper Density Control - chainsaw	27,095
Acres of Juniper Density Control - chainsaw/prescribed fire	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire	7,510
Acres of Sagebrush/Juniper cover control - mechanical	488
Acres of Juniper Control as part of seeding treatments - chainsaw	8,344
Total Acres of Vegetation Treatment	48,633
Acres Open to Domestic Livestock Grazing	82,923
Acres Closed to Domestic Livestock Grazing	8,233
Acres in Forage Reserve	11,782

- For more detail about this alternative refer to FEIS Chapter 2, Section 2.3.3. This alternative would reduce western juniper densities and distribution on approximately 50,000 acres across the Grassland during the next 10 years. It would move the present area and distribution of plant associations on the Grassland closer to its historic range of variability. This would be accomplished using prescribed fire, chainsaw cutting, and mechanical treatments (Map 9 - Alternative C Proposed Action).

- Approximately 10,000 acres of crested and tall wheatgrass seedings would be rehabilitated by seeding a mixture of shrubs, grasses, and forbs (native species, cultivars of native species, and non-native species) over the next 10 years. This rehabilitation would occur on the Boyce, Rush, Juniper Butte, Gorge, Fox, and North Allotments. This action is designed to move past dryland, farmed sites closer to their historic range of variability and increase the function of the areas in providing wildlife habitat.

- Livestock grazing would be authorized on 19 allotments totaling approximately 82,923 acres. Allotment management plans would be updated to reflect current management direction, legal requirements, current standards for grazing, and short and long-term monitoring requirements.

- The Peninsula, Clevenger, and Goldmine/Falls allotments and the Squaw Creek Pasture (of the Holmes-Squaw Creek Allotment) would be closed to grazing (approximately 8,233 acres).

- The Canadian Bench and most of the Lower Desert Allotment would be designated as forage reserves (approximately 11,782 acres).

- The Mud Springs pasture boundary fence (Fox Allotment) would be moved to facilitate improved livestock distribution and reduced grazing pressure on the historic Mud Spring Creek floodplain.

1.6 Decision Framework

The Forest Supervisor, Ochoco National Forest, and Crooked River National Grassland will make the following decisions:

- Whether or not, and to what degree, to control western juniper density and distribution to move towards a more historic array of vegetative conditions and plant associations.
- Whether or not to till, drill, seed, and fertilize stagnant crested wheatgrass seedings to hasten the re-establishment of native vegetative communities.
- Whether or not to close grazing allotments.
- Whether or not to reauthorize grazing on the Grassland.

1.6.1 The decision to control or not control the density and distribution of juniper will be based on the following factors:

- How well each alternative moves juniper density and distribution toward the historic range of variability.
- How well each alternative meets Grassland objectives and standards and guidelines for wildlife habitat, particularly for mule deer and pronghorn antelope winter range.
- The presence of old-growth (pre-settlement) juniper.

    - If the decision is made to control the density and distribution of western juniper, he will then decide:
        - The methods that would employed, including chainsaw felling, mechanical equipment (brush beaters, etc.), prescribed fire, or a combination of methods.
        - Where treatments would be implemented.
        - How many acres would be treated.

    - The decision on which treatment alternative to select will be based on the following factors:
        - The effects of the proposed treatment on wildlife habitat.
        - The number of acres within or approaching HRV after treatment.
        - The effects of treatments on old growth juniper.
        - Which treatment alternative is most cost effective.

1.6.2 The decision to till, drill, seed, and fertilize stagnant crested wheatgrass seedings will be based on the following factors:

- The likelihood of the treatments to hasten movement toward native vegetation communities.
- The effects of the proposed treatment on wildlife habitat and other resources.

    - If the decision is to till, drill, seed, and fertilize, he will then decide:
        - How many and what acres would be treated.
        - What species would be used to replant those treated acres.

    - The decision on which treatment alternative to select will be based on the following factors:
        - The number of acres of “stagnant” seedings treated.
        - The number of acres of desirable forage produced for domestic livestock.
        - The number of acres of improved pronghorn antelope winter range.
        - Which treatment alternative is most cost effective.
        - Number of acres of improved wildlife habitat.

1.6.3 The decision to close allotments to grazing will be based on the following factors:

- The ability to meet natural resource needs.
- The ability to maintain flexibility in the range program implementation.

  - If the decision is to close allotments to grazing, he will then decide:
    - Which allotments to close.

  - The decision on which alternative to select will be based on the following factors:
    - Current status of existing allotments (open or vacant).
    - Effects on wildlife habitat, particularly mule deer and pronghorn antelope winter range.
    - Demand for pasture.
    - Availability of alternative pasture in the case of wildfire or other events that preclude using all or most of an existing allotment.
    - Current ecological trends.

1.6.4 The decision to reauthorize grazing on all or part of the 23 allotments will be based on the following factors:

- Compliance with the 1995 Rescission Bill.
- Consistency with the Grassland LRMP.

  - If the decision is to authorize grazing, he will then decide:
    - The term of the new agreement with the Gray Butte Grazing Association.
    - Specific management strategies appropriate for each allotment.

  - The decision on which alternative to select will be based on the following factors:
    - The effects of the grazing strategies on wildlife habitat.
    - The ability to demonstrate progressive grassland agriculture.
    - The ability of the Gray Butte Grazing Association to meet standards and implement direction from the Land and Resource Management Plan.

1.7 Public Involvement

1.7.1 Process Description

Scoping and public involvement are ongoing processes used to invite public participation and to obtain input on: the scope of the analysis, alternatives to be evaluated, and issues to be addressed.

The scoping process for this analysis was initiated on February 18, 2003 when the NOTICE OF INTENT to prepare and Environmental Impact Statement was published in the Federal Register.

In January 2003, a letter was sent to the Confederated Tribes of the Warm Springs and the Burns Paiute and Klamath Tribes informing them of the project and requesting their comments, suggestions, and concerns. No response was received from either the Burns Paiute or Klamath Tribes.

Letters were not sent to either the Confederated Tribes of the Grand Ronde or Umatilla. The Confederated Tribes of the Grand Ronde indicated in a phone conversation that they were not interested in projects east of the crest of the Cascades. A phone call to the Confederated Tribes of the Umatilla also indicated that they were not interested in the project as they considered it outside their area of interest.

Also in January 2003, scoping letters were sent to 159 individuals, organizations, and agencies. It included the proposed action, management summaries, and preliminary issues and concerns associated with the proposed actions and activities. Input concerning the proposed actions was solicited. Notices soliciting comment on the project were published in the Madras Pioneer, Central Oregonian, and Bend Bulletin newspapers. Thirty letters and nine phone calls were received in response to scoping efforts.

In April 2003 the Confederated Tribes of the Warm Springs Reservation Cultural and Heritage Committee toured the Grassland. Proposed vegetation treatment project sites were visited, livestock grazing was discussed, and cultural plants were identified and dug for personal use. The committee expressed little interest in the historically farmed and seeded sites. They were comfortable with existing grazing practices on the Grassland. They expressed interest in the scablands or low sage sites where most of the cultural plants exist. Later on in April 2003 two members of the CTWSR revisited the Grassland with a Forest Service archaeologist to dig plants for personal use and to discuss a variety of topics.

Also in April 2003 staff from the Grassland and from the U.S. Fish and Wildlife Service office in Bend, Oregon toured the Grassland to discuss the proposed vegetation and management actions.

In May 2003 staff from the Grassland conducted a field tour for various interested parties to discuss management of western juniper and old growth juniper. Attendees included members of the Crook County Natural Resources Committee, Oregon Department of Fish and Wildlife, Oregon State University Extension, Bureau of Land Management and others. The Oregon Natural Desert Association (ONDA) and the Native Plant Society of Oregon were invited but did not attend. Notes from the field trip were faxed to ONDA, and another invitation to tour the Grassland was extended in August 2003 but they expressed no interest in setting up a tour.

On May 21, 2003 a follow-up letter was sent to the 30 people and organizations who commented on the Proposed Action informing them of our progress on alternative and issue development. No comment was received in response to this mailing. That same day, Grassland staff attended a meeting with the Oregon Hunter's Association and the Gray Butte Grazing Association to update them about our progress.

In January 2004 the Grassland gave a presentation to the Central Oregon Chapter of the Native Plant Society of Oregon and conducted a field trip with them in June 2004 to discuss western juniper management and rehabilitation of previously farmed sites.

On three different occasions in May and September 2004 additional government-to-government consultation occurred about this project during coordination meetings held between the tribes and the Forest Service.

The project has also included in each *Schedule of Projects (SOP) for the Ochoco and Deschutes National Forests and the Prineville District of the Bureau of Land Management* since the Spring 2003 issue. The SOP is mailed quarterly to approximately 3,200 individuals or organizations. The project was also posted on the combined Deschutes and Ochoco National Forests and Crooked River National Grassland website (www.fs.fed.us/r6/centraloregon/index-sop.html).

1.7.2 Public Response to the Draft Environmental Impact Statement (DEIS)

The Notice of Availability for the Crooked River National Grassland Vegetation Management/Grazing Draft Environmental Impact Statement (DEIS) was published in the Federal Register on April 9, 2004 (Vol. 69, No. 69, ER-FRL-6650-1, EIS No. 040151). Public Notices briefly describing the analysis were published in two local newspapers. A news release was submitted to the local media informing people of:

- The time and location of the April 17, 2004 Open House,
- The desire for comments.
- A summary of the proposed actions.
- The contact address.
- A brief history of the Grassland.
- The location of the DEIS on the internet.

The Forest Service is required to send complete copies of any DEIS to various Federal and State agencies. The DEIS was sent to 31 representatives of state and federal agencies and nine tribal representatives. A list of interested persons and organizations requesting a copy of the DEIS was compiled throughout the analysis process. A copy of the DEIS was sent to 152 interested parties. The DEIS was distributed in both hardcopy and electronic format. The DEIS was also available for review on the World Wide Web.

Following the release of the DEIS, meetings were conducted with the Gray Butte Grazing Association, and an Open House meeting was conducted on April 17, 2004 to present the DEIS to the public. Nine people including Grassland personnel attended the meeting. The Open House meeting provided the public an opportunity to submit comments and obtain a copy of the DEIS if they desired one.

Comments were provided by 24 individuals and organizations from: the Open House, telephone contacts, and letters. All substantive comments were considered. Comments considered and responses are recorded in Appendix X of the Final Environmental Impact Statement (FEIS). Public comment led to the need for supplemental documentation of existing analysis which is the basis for the differences between the DEIS and the FEIS. Changes between the FEIS and DEIS are explained within the response to comments generating those changes (Appendix X).

1.8 Issues

Based on a review of issues and concerns raised during the scoping process, five significant issues were identified. These issues were used to develop alternatives to the proposed action and are discussed in the environmental consequences section.

Issues are points of discussion, debate, or dispute about environmental effects. A significant issue is one that is used to formulate alternatives, prescribe mitigation measures, or analyze environmental effects. An issue is deemed significant because of the extent of its geographic distribution, the duration of the effects, or the intensity of interest or resource conflict.

40 Code of Federal Regulations (CFR), 1500.1(b), states that National Environmental Policy Act (NEPA) documents must "… concentrate on issues that are truly significant to the action in question, rather than amassing needless detail." 40 CFR 1500.4(g) further requires that NEPA documents "… identify significant environmental issues deserving of study, but also to de-emphasize insignificant issues …" NEPA documents only require a brief discussion of other than significant issues (40 CFR 1500.2(b)).

1.8.1 Issue 1

If not managed properly, livestock use can cause downward ecological trends.

<u>Measurement Standard:</u>

- Ecological Trend as measured using existing Condition & Trend Transects and Ecological-Site Write-ups.

1.8.2 Issue 2

Proposed soil-disturbing activities such as tillage, prescribed fire, mechanical juniper removal, and grazing have the potential to increase the amount and distribution of noxious weeds and invasive plants.

Measurement Standards:

- Acres of treatment (grazing, tillage/seeding/fertilization, mechanical juniper control, prescribed fire, etc.).
- Acres of treatment located on clay soils (clay soils provide excellent habitat for medusahead, a noxious weed).

1.8.3 Issue 3

Proposed management activities such as tillage, prescribed fire, juniper control, and grazing have the potential to affect water quality and quantity by changing upland and riparian vegetative cover and complexity.

Measurement Standard:

- Acres of proposed treatment activity located in or adjacent to the Deschutes River, the Crooked River, the Metolius River, Squaw Creek, Mud Springs Creek, Lone Pine Flat and Willow Creek, the major streams and rivers on the Grassland.

1.8.4 Issue 4

Proposed management activities (grazing, tillage/seeding/fertilization, prescribed fire, and juniper control) may affect the quality, quantity and distribution of wildlife habitat, specifically mule deer and pronghorn LRMP designated winter range (Map 16 - LRMP Management Area).

Measurement Standards:

- Acres of designated mule deer winter range treated (tilled/seeded/fertilized, prescribed burned, juniper controlled).
- Acres of designated antelope winter range treated (tilled/seeded/fertilized, prescribed burned, juniper controlled).
- Acres of juniper thinning in the overabundant M3 cover class (within designated deer and antelope winter range).

1.8.5 Issue 5

Manipulation of western juniper on the Grassland (how many acres controlled, the size of juniper to be controlled and the location of the juniper controlled) can affect visual qualities, old growth, and wildlife habitat diversity values.

Measurement Standard:

- Acres of juniper control by cover/seral class.

1.8.6 Issue 6

Grazing domestic sheep in potential bighorn sheep habitat increases the risk of transmitting disease if bighorn sheep are re-introduced to their historic habitat on the Grassland.

This issue drove the development of Alternative D where the forage reserves for domestic sheep were dropped. The scoping process facilitated this change.

Measurement Standard:

- Presence of domestic sheep within seven miles (recommendation from Oregon Department of Fish and Wildlife) of proposed bighorn sheep habitat.

1.9 Other Issues

The following issues were raised during scoping, evaluated by the ID Team, and determined to be issues important to the project but not significant. The discussion following each issue provides the logic for the decision.

1.9.1 Issue A

Tillage and prescribed fire have the potential to affect the quality, quantity, and distribution of cultural plants deemed important by Native Americans of the Confederated Tribes of the Warm Springs Reservation and treaty.

After scoping and consultation with the cultural committee of the Confederated Tribes of the Warm Springs Reservation, the ID Team decided that this issue, while important, was not significant because it was not a point of debate. Most of the sites where cultural plants exist today are on rocky soils where tillage is impractical. When significant populations of cultural plants are encountered during any project layout, including prescribed fire, all action alternatives require that they be protected. Consultation with the Tribes would occur on all proposed activities occurring in or adjacent to probable cultural plant sites.

1.9.2 Issue B

Proposed management activities including grazing, tillage/seeding/fertilization, prescribed fire, and juniper control using mechanical and chainsaw methods have the potential to effect soil productivity, the rate of erosion, and soil microorganisms.

This issue was deemed non-significant because it was not in debate under the proposed action and did not generate another alternative. The project design criteria for Alternative B, C, and D are intended to protect the soil resource. Additionally, all alternatives have both positive and negative effects on the soil resource, and they will be disclosed in the effects discussion in this FEIS, Chapter 3, Section 3.5.3.

1.9.3 Issue C

Proposed Forage Reserve Allotment creation/designation could increase the number of acres currently being grazed by domestic livestock on the Grassland.

This issue was deemed non-significant because under existing management livestock could currently graze the two allotments (Lower Desert and Canadian Bench) proposed for forage reserves. Establishing these allotments as forage reserves would not result in an increase in the number of acres being grazed on the Grassland. Because these areas would only be grazed in place of pastures and/or allotments closed to grazing due to wildfire or management activities, grazing in these two allotments would be limited. Under this alternative grazing would not be expected to occur every year. No forage reserves would be created under Alternatives A, B, or D.

1.10 References Chapter 1

Buckhouse, J.C. 1999. Juniper and Watersheds. Range Field Day 1999 Progress Report Juniper Woodlands History Ecology and Management

Eddleman, L.E. 1983. Some Ecological Attributes of Western Juniper. IN: 1983. Progress Report-Research in Rangeland Management. Special Report 682, Ag. Exp Station, OSU, Corvallis and Ag. Research Service, USDA. Pp. 32-34.

Land and Resource Management Plan, Part 2, Crooked River National Grassland 1989. USDA, Forest Service, PNW.

Obermiller, Fred 2000. Evolution and Purpose of the Crooked River National Grassland. OSU Extension.

Oregon Department of Agriculture. 2002. Website, http://oda.state.or.us/

CHAPTER 2 - Alternatives Including the Proposed Action

2.1 Introduction

This section provides a discussion of a no action alternative and three action alternatives. It also briefly discusses other alternatives that were considered but dropped from further consideration and the reasons they were eliminated from further analysis.

"Grassland owned public lands" referred to in this chapter are public lands that are part of the National Forest system. Grassland refers to the Crooked River National Grassland Ranger District that is administered by the Ochoco National Forest and the Crooked River National Grassland.

Implementation of the various actions selected by the deciding officer will be dependent upon adequacy of funding allocations to carryout those actions. While local priorities can be set for discretionary spending, general allocations to various federal agencies are determined by congressional process.
In January 2004 the Grassland gave a presentation to the Central Oregon Chapter of the Native Plant Society of Oregon and conducted a field trip with them in June 2004 to discuss western juniper management and rehabilitation of previously farmed sites.

On three different occasions in May and September, 2004 additional government to government consultation occurred about this project during coordination meetings held between the tribes and the Forest Service.

2.2 Alternatives Considered but Dropped From Further Consideration

2.2.1 No Grazing - Vegetation Treatment Alternative

This alternative proposes to eliminate livestock grazing across the Grassland but implement the Proposed Action vegetation treatments as described under Alternative C - Proposed Action. This alternative was dropped because it does not meet the purpose and need for the project.

"*There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area.*" (FEIS, Chapter 1, Section 1.4.2.3). This need would not be met with the "No Grazing - Vegetation Treatment" alternative. The Crooked River National Grassland Land and Resource Management Plan (LRMP), the National Forest Management Act, and the Bankhead-Jones Farm Tenant Act all indicate intent for the Grassland to be grazed as part of a multiple use mandate. In addition, 20 percent of the livestock within Jefferson County are dependent upon the Grassland for forage. Livestock sales represent 27 percent of the agricultural sales within the County making livestock production the County's single largest agricultural commodity.

Other purposes and needs that refer to moving the existing vegetative conditions closer to historic conditions (such as juniper control to maintain sagebrush steppe plant communities) would be satisfied with this alternative.

In addition, the effects of this alternative merely represent a combination of the effects of Alternatives A and C, where Alternative A provides a description of the effects of no grazing (FEIS, Chapter 3) and Alternative C provides a description of the effects of proposed vegetative treatments (FEIS, Chapter 3). Therefore, this alternative would provide no substantial contribution to the range of alternatives considered in detail.

2.2.2 No Grazing on the Westside of the Grassland (west of the Deschutes River) – Vegetation Treatment Alternative

This alternative proposes to eliminate livestock grazing west of the Lower Crooked River Valley and Willow Creek sub-watersheds on the Grassland but retain the vegetation treatments proposed in Alternative C - Proposed Action. This alternative was dropped from further consideration because it does not meet the purpose and need of authorizing grazing on suitable lands (FEIS, Chapter 1, Section 1.4.2.3) "*There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area.*").

Other purposes and needs that refer to moving the existing vegetative conditions closer to historic conditions (such as juniper control used to maintain sagebrush steppe plant communities) would be satisfied with this alternative.

In addition, the effects of this alternative merely represent a combination of the effects of Alternatives A and C, where Alternative A provides a description of the effects of no grazing (FEIS, Chapter 3) (specifically on the Westside) and Alternative C provides a description of the effects of proposed vegetative treatments (FEIS, Chapter 3). Therefore, this alternative would provide no substantial contribution to the range of alternatives considered in detail.

2.3 Action Alternatives Considered in Detail

2.3.1 Alternative A - No Action

2.3.1.1 Grazing

This alternative would eliminate grazing from 102,938 acres of Grassland administered lands. Twenty-three allotments would be closed to grazing (Map 7 - Alternative A - No Action). Livestock use would cease after the record of decision (ROD) was signed and administrative review proceedings were exhausted. No new grazing permits would be issued.

The Gray Butte Grazing Association would no longer be responsible for the maintenance of the following rangeland improvements which would remain on the Grassland:

- Approximately 750 miles of existing fences including approximately 550 miles of allotment boundary fence, and 200 miles of interior fence.
- Approximately 30 road cattleguards.
- Approximately 100 miles of buried water pipelines.
- 29 wells.
- 175 livestock/wildlife water troughs improvements.

2.3.1.2 Juniper Treatment and Seeding/Tilling/Fertilizing

No juniper treatment is included under this alternative.

No seeding, tilling, and/or fertilizing is included under this alternative.

2.3.1.3 Comparison to Proposed Action

As compared to the Proposed Action, Alternative A **does not** propose the following actions:

- Authorization of any livestock grazing on the Grassland.
- Establishment of forage reserves.
- Construction of new fences.
- Removal of two cattleguards.
- Western juniper removal.

    - Prescribed fire, chain saw felling, or other mechanical treatments used to reduce juniper densities and distributions.
- Seeding in historic crested or tall wheatgrass (Mud Springs Creek) seedings.
    - Tilling, disking, or fertilizing.

Table 2-0 following displays how the alternative actions address the needs (FEIS, Chapter 1, Section 1.4.2).

Table 2-0 Alternative A - Degree Actions Address Stated Needs

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
GRAZING					
No Grazing	Does not address need.	Does not address need.	Does not address need.	Provides the most organic matter on the soil surface of the alternatives, and provides habitat for birds who only prefer tall stubble heights.	Fully meets need.
JUNIPER TREATMENT					
No Juniper Treatment	Does not address need.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
SEEDING/TILLING/FERTILIZING					
No Seeding/Tilling/Fertilizing	Does not address need.	Does not address need.	Does not address need.	Does not address need.	Does not address need.

2.3.2 Alternative B - Current Management

This alterative reflects current management as defined in existing allotment management plans and annual operating instructions. Table 2-1 displays management activities by allotment proposed under this alternative.

2.3.2.1 Grazing

Authorize domestic livestock grazing on 23 grazing allotments totaling approximately 102,938 acres of Grassland owned public lands on the Crooked River National Grassland (Map 8 - Alternative B - Current Management, and Table 2-1). All existing allotments would remain available and open for domestic livestock grazing. Authorized stocking rates would remain the same, 21,714 animal unit months (AUMs). This would be the maximum allowable stocking rate for livestock on the Grassland. Actual numbers and length of grazing would be dependant upon meeting utilization standards (FEIS, Chapter 2, Section 2.4.1). New allotment management plans would be written and new permits would be issued.

The implementation of the following livestock management activities would continue to occur under Alternative B:

- Manage twelve allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Gorge, Grizzly, Lone Pine, North, Peninsula, Round Butte, Rush, and Steer) with versions of deferred rotation grazing (Table 2-1). Under this system, livestock are managed in one herd that moves through a series of pastures on a given allotment. Each pasture is grazed once during the grazing season. The pasture is grazed to a prescribed level of utilization standard such as a

4-inch stubble height on a prescribed key grass species such as bluebunch wheatgrass. The pasture-grazing schedule is adjusted yearly with livestock beginning in a different pasture each year. The last pastures grazed each year are grazed after the grass seed has ripened (the definition of deferred grazing). This system offers good time control of grazing and enables forage species such as grasses and forbs to complete the growing season un-grazed by livestock on about half of the pastures each year. Most of the allotments on the Grassland using this system have between six and ten pastures.

- Manage three allotments (Holmes-Squaw Creek, Lower Desert, and Williams) under a straight rotation grazing system. A straight rotation is similar to a deferred rotation grazing system in that each year the pastures are grazed in a different sequence, however, under a straight rotation livestock are removed from the allotment prior to the grass seed becoming ripe or enter the last pasture(s) prior to the grass seed becoming ripe but staying within that pasture until after the grass seed becomes ripe.

- Manage one allotment (Juniper Butte Allotment) under a short duration grazing system (Table 2-1). Short-duration grazing differs from deferred rotation grazing in that the livestock herd grazes the pastures for a shorter time-period with the possibility of returning later in the season to re-graze some of the previously grazed pastures. Although not a grazing standard, this grazing regime has resulted in taller stubble heights over the past four years. As with deferred grazing, at the end of the season the permittee must leave each pasture with sufficient stubble height to meet the monitoring standard.

- Manage seven allotments/pastures (Canadian Bench, Clevenger, Cotter Pond, Devine, Goldmine/Falls, Kennedy, and Weaning allotments) under a season long (one pasture) grazing system, with short grazing seasons. Season long grazing usually occurs when livestock have only one pasture to graze in. The cattle enter when vegetation within the pasture meets readiness criteria in the spring and leave when the stubble height standard is met. The livestock leave and return to their home ranch or to other leased ground when the grazing standard has been met. The Canadian Bench, Clevenger, and Goldmine/Falls Allotments are presently vacant, that is, although they are available, they do not have an active grazing permit associated with them at this time.

The Gray Butte Grazing Association would continue to be responsible for the maintenance of the following rangeland improvements which would remain on the Grassland:

- Approximately 750 miles of existing fences including approximately 550 miles of allotment boundary fence and 200 miles of interior fence.
- Approximately 30 road cattleguards.
- Approximately 100 miles of buried water pipelines.
- 29 wells.
- 175 livestock/wildlife water developments.

2.3.2.2 Juniper Treatment and Seeding/Tilling/Fertilizing

No juniper treatment is included under this alternative.

No seeding, tilling, and/or fertilizing is included under this alternative.

2.3.2.3 Comparison to Proposed Action

As compared to the Proposed Action, Alternative B **does not** propose the following actions:

- Establishment of forage reserves.
- Construction of new fences.
- Removal of two cattleguards.

- Western juniper removal.
    - Prescribed fire, chain saw felling, or other mechanical treatments used to reduce juniper densities and distributions.
- Seeding in historic crested or tall wheatgrass (Mud Springs Creek) seedings.
    - Tilling, disking, or fertilizing.

Table 2-1 (below) displays management activities by allotment proposed to continue under this alternative.
Table 2-1A following displays how the alternative actions address the needs (FEIS, Chapter 1, Section 1.4.2).

Table 2-1 Alternative B Proposed Management Activities, CRNG

GRAZING ALLOTMENT		PROPOSED VEGETATION TREATMENT ACRES					PROPOSED GRAZING ACTIONS					
NAME	ACRES	Juniper Control-Chainsaw	Juniper Control-Chainsaw / Prescribed Fire	Sagebrush/Juniper Control-Prescribed Fire	Juniper Control, with Seeding	Mechanical Treatment of Shrubs – Fuel Break	Seeding	Acres Open to Grazing	Acres Closed to Grazing	Acres of Forage Reserve	Authorized AUMs	Grazing System
Blanchard	7,694	0	0	0	0	0	0	7,694	0	0	2,113	Deferred Rotation
Boyce	5,653	0	0	0	0	0	0	5,653	0	0	1,878	Deferred Rotation
Canadian Bench	1,592	0	0	0	0	0	0	1,592	0	0	332	Season Long
Clevenger	638	0	0	0	0	0	0	638	0	0	41	Season Long
Cotter Pond	197	0	0	0	0	0	0	197	0	0	40	Season Long
Cyrus	9,325	0	0	0	0	0	0	9,325	0	0	1,878	Deferred Rotation
Devine	80	0	0	0	0	0	0	80	0	0	7	Season Long
Fox/Dump	6,225	0	0	0	0	0	0	6,225	0	0	1,641	Deferred Rotation
Goldmine/Falls	720	0	0	0	0	0	0	720	0	0	54	Season Long
Gorge	1,182	0	0	0	0	0	0	1,182	0	0	142	Deferred Rotation
Grizzly	9,179	0	0	0	0	0	0	9,179	0	0	2,348	Deferred Rotation
Holmes-Squaw Cr.	6,591	0	0	0	0	0	0	6591	0	0	274	Straight Rotation
Juniper Butte	7,554	0	0	0	0	0	0	7,554	0	0	2,214	Short Duration
Kennedy	700	0	0	0	0	0	0	700	0	0	264	Season Long
Lone Pine	9,222	0	0	0	0	0	0	9,222	0	0	1,878	Deferred Rotation
Lower Desert	11,711	0	0	0	0	0	0	11711	0	0	883	Straight Rotation
North	10,251	0	0	0	0	0	0	10,251	0	0	2,802	Deferred Rotation
Peninsula	1,680	0	0	0	0	0	0	1,680	0	0	198	Deferred Rotation
Round Butte	2,494	0	0	0	0	0	0	2,494	0	0	423	Deferred Rotation
Rush	6,497	0	0	0	0	0	0	6,497	0	0	1,614	Deferred Rotation
Steer	2,291	0	0	0	0	0	0	2,291	0	0	533	Deferred Rotation
Weaning Pasture	238	0	0	0	0	0	0	238	0	0	20	Season Long
Williams	1,224	0	0	0	0	0	0	1,224	0	0	137	Straight Rotation
TOTALS	**102,938**	**0**	**0**	**0**	**0**	**0**	**0**	**102,938**	**0**	**0**	**21,714**	

Table 1-1A Alternative B - Degree Actions Address Stated Needs

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
GRAZING - Authorize domestic livestock grazing on 23 grazing allotments totaling approximately 102,938 acres of Grassland owned public lands on the Crooked River National Grassland. All existing allotments would remain available and open for domestic livestock grazing. Authorized stocking rates would remain the same, 21,714 animal unit months (AUMs).					
Manage fifteen allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Gorge, Grizzly, Holmes-Squaw Creek, Lone Pine, Lower Desert, North, Peninsula, Round Butte, Rush, Steer, and Williams) with versions of deferred rotation grazing.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short and mid stubble heights.	Does not address need.
Manage one allotment (Juniper Butte Allotment) under a short duration grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
Manage seven allotments/pastures (Canadian Bench, Clevenger, Cotter Pond, Devine, Goldmine/Falls, Kennedy, and Weaning allotments) under a season long (one pasture) grazing system, with short grazing seasons.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
JUNIPER TREATMENT					
No Juniper Treatment	Does not address need.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
SEEDING/TILLING/FERTILIZING					
No Seeding/Tilling/Fertilizing	Does not address need.	Does not address need.	Does not address need.	Does not address need.	Does not address need.

2.3.3 Alternative C - Proposed Action (Preferred Alternative)

This alternative is considered the preferred alternative. Table 2-2 displays management activities by allotment proposed under this alternative. Included are proposed vegetation management activities and grazing related actions (refer to Map 9 - Alternative C - Proposed Action). Appendix E, "Alternatives C and D Vegetation Treatment Project Descriptions", displays unit specific information including: unit size, prescription, and expected change in seral condition.

2.3.3.1 Grazing

Authorize livestock grazing on approximately 82,923 acres of Grassland owned public lands on 19 allotments (Map 9 - Alternative C - Proposed Action). The upper limit for authorized livestock stocking would be 20,289 AUMs. Actual numbers and length of grazing would be dependant upon meeting utilization standards (FEIS, Chapter 2, Section 2.4.1). New allotment management plans would be written and new permits would be issued.

The implementation of the following livestock management activities would occur under Alternative C:

- Manage two allotments (Gorge and Steer) under a form of deferred grazing.
- Manage two allotments (East Winter and Holmes-Williams) under a straight rotation grazing system.
    - The Holmes Pasture in the Holmes-Squaw Creek Allotment would be combined with the Williams Allotment. The new allotment, named the Holmes-Williams Allotment, would have two pastures, encompassing 2,620 acres. This allotment is within the Metolius Deer Winter Range and as such the livestock would generally be off of the allotment prior to August 1. The Squaw Creek Pasture (5,195 acres) would remain closed to grazing (Map 9 - Alternative C - Proposed Action). The Squaw Creek Pasture has been eliminated from grazing, as it excludes livestock grazing from the bull trout habitat found within Squaw Creek.
    - Create the East Winter Allotment by removing the East and West Winter Pastures from the Lower Desert Allotment. This allotment would have eleven Forest Service pastures totaling approximately 1,521 acres (Map 9 - Alternative C - Proposed Action) and would be managed with mule deer winter range maintenance or improvement as an objective. Bitterbrush is a key wildlife browse species on the winter range. Monitoring livestock's annual use of bitterbrush would be required. Monitoring would assure that sufficient bitterbrush leaf and leader growth would be left following livestock grazing for deer browse and for shrub health (FEIS, Chapter 2, Section 2.4.3). Domestic livestock use would generally not be allowed after August 1 to eliminate potential conflicts between livestock and mule deer needs. The East and West Winter Pastures are presently permitted to an active permittee. The remainder of the Lower Desert Allotment would become a forage reserve, while these pastures would remain with the existing permittee.
- Divide the Juniper Butte Allotment into two new allotments: Juniper Butte to the west and Haystack to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line between the two allotments. This change is proposed as Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway. Presently two different permittees graze these two sides of the allotment.

- Manage the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system (which has been practiced successfully here in the past). The permittee on this allotment has exceeded the minimum stubble heights (taller stubble than the standard requires) on over 75 percent of his pastures over the past four years. On the remaining 25 percent of the allotment the stubble height standards have been consistently meet.
- Manage the new Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a deferred rotation grazing system.

- Manage the following ten allotments: Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush under a rest rotation grazing system. This action would improve the accumulation of soil, organic matter needed to: enhance deep-rooted native perennial grass recruitment, increase the diversity of stubble height retained for wildlife, and aid the vigor of existing plants. Crested wheatgrass pastures may or may not be rested depending on native bunchgrass presence, as the risk of creating very unpalatable grass exists if crested wheatgrass is rested too much. Rest-rotation grazing is similar to deferred rotation grazing but includes the addition of a rest pasture. The rest pasture is rested from grazing for an entire grazing season. Each pasture is rested from grazing for an entire grazing/growing season once during each rotation period (number of years to cycle through all rotation sequences of a grazing rotation). The rest period gives grazed plants additional time to store carbohydrates, regain vigor, and produce litter that will contribute to the organic matter in the soil that may be needed to promote upward ecological trends. The rest pasture also leaves part of each allotment with the full growth of grass at the end of season, providing desirable habitat for ground nesting birds. Even though crested wheatgrass pastures may not be rested, at least one native grass pasture or seeding (pasture) per allotment will be rested each year.

    - The Mud Springs Pasture boundary fence on the Fox Allotment would be realigned to improve livestock use and distribution, and to relieve grazing pressure on the Mud Springs Flat area at the end of the authorized season of use. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).

- Manage five allotments/pastures (Canadian Bench, Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons).

- Close four allotments/pastures (Clevenger, Goldmine/Falls, and the Peninsula Allotments, and the Squaw Creek Pasture of the Holmes – Squaw Creek Allotment) 8,233 acres of Grassland administered lands, to livestock grazing (Map 9 - Alternative C - Proposed Action).

    - Two cattleguards would be removed from closed allotments using a backhoe.

- Manage two existing allotments (Canadian Bench and Lower Desert) as forage reserves totaling approximately 11,782 acres of Grassland administered public lands. Forage reserves would provide places for Grassland permitted livestock to graze while their permitted allotments are being rehabilitated. Use of a forage reserve would be temporary and on an "as needed" basis. Approximately 6,500 acres of Grassland administered public land proposed as forage reserve falls within the Metolius Deer Winter Range (MA-G2) land allocation. Bitterbrush is a key wildlife browse species in the winter range. Monitoring of annual use of bitterbrush would be required (FEIS, Chapter 2, Section

2.4.3). Monitoring would assure that sufficient bitterbrush is left following livestock grazing for deer and shrub health. Season of use for domestic livestock would generally not be allowed after August 1 in order to eliminate potential conflicts between livestock and mule deer needs (FEIS, Chapter 2, Section 2.4.3).

- In the Lower Desert Allotment, approximately 15 miles of new three-wire fence line would be constructed. Approximately ten water sets would be established and water hauled to livestock when the reserves were active. This allotment would be grazed on a rest-rotation system.

- The Canadian Bench Allotment would only be grazed by domestic sheep because of the large number of private in holdings, the prohibitive costs of fencing, and the lack of surface water sources. No fences would be constructed. All water would be hauled.

The Gray Butte Grazing Association would continue to be responsible for the maintenance of the following rangeland improvements which would remain on the Grassland:

- Approximately 750 miles of existing fences including approximately 550 miles of allotment boundary fence and 200 miles of division fence.
- Approximately 17 miles of new boundary and division fence.
- Approximately 28 road cattleguards.
- Approximately 100 miles of buried water pipelines.
- 29 wells.
- 185 livestock/wildlife water developments.

2.3.3.2 Juniper Treatment and Seeding/Tilling/Fertilizing

The following activities are also included under Alternative C:

- Density management and control of approximately 50,000 acres of western juniper over the next ten years using chainsaw cutting and prescribed fire (Map 9 - Alternative C - Proposed Action, and Table 2-2 Alternative C - Proposed Management Activities, below).

  - Chainsaw felling of approximately 27,100 acres.
  - Chainsaw felling followed by low intensity prescribed fire seven plus years following felling (see FEIS, Chapter 2, Section 2.5.2) of approximately 5,200 acres.
  - Prescribed burning approximately 7,500 acres.
  - Mechanically treating approximately 490 acres. Mechanical treatment would utilize brush beater or shrub mowing equipment that would treat small-sized canopies such as sapling juniper/sagebrush.

- Rehabilitate 8,350 acres of stagnant "old" crested and tall wheatgrass seedings over the ten-year planning period (Map 9 - Alternative C - Proposed Action). Of the 8,350 acres proposed to be "treated" only approximately half, or about 4,000 acres, would actually be tilled and seeded. The objective is to create a mosaic of cover types, leaving sagebrush islands within the treatment areas. Refer to the Project Design Criteria and Monitoring Common to Alternatives C and D (Section 2.5.7) later in Chapter 2 for seeding detail. These projects would include:

  - Removing post settlement aged juniper (included as part of the 27,100 acres proposed for chainsaw felling only juniper treatment).
  - Remaining untreated areas would be left within the 8,350 "treated" acres creating a mosaic of sagebrush and tilled/seeded acres.

- Tilling (to 10 inch soil depth) using a farm or crawler tractor pulling rangeland discs.
    - Where tilling is planned to occur, all post settlement age juniper (less than 80 year old juniper) would be removed prior to tilling. Occasional large junipers that provide diversity to an early seral (grass and shrub) landscape would be left. For the purpose of this analysis we have defined post settlement junipers as those juniper trees that were established since 1920.
- Rangeland drilling (to a depth of 1-3 inches) using a rangeland drill pulled by a farm or crawler tractor.
- Broadcast seeding.
- Fertilizing where needed (approximately 4,170 acres depending upon soil analysis results).
    - The type of fertilizer would likely be a 16-16-16-20 (Nitrogen-Phosphorous- Potassium-Sulfur) formulation, with trace elements dependent upon soil analysis results.
    - Application would be by ground-based equipment at a rate of 100 to 200 pounds per acre (depending upon soil analysis results).

Table 2-2 (below) displays management activities by allotment proposed to continue under this alternative, while Table 2-2A following displays how the alternative actions address the needs (FEIS, Chapter 1, Section 1.4.2).

Table 2-2 Alternative C - Proposed Action, Management Activities

NAME	ACRES	Juniper Control-Chainsaw	Juniper Control-Chainsaw / Prescribed Fire	Sagebrush /Juniper Control-Prescribed Fire	Juniper Control with Seeding	Seeding	Mech. Treatment Shrubs – Fuel Break	Acres Open to Grazing	Acres Closed to Grazing	Acres of Forage Reserve	Authorized AUMs	Grazing System
Blanchard	7,694	3,952	880	1,591	0	0	0	7,694	0	0	2,113	Rest Rotation
Boyce	5,653	0	0	0	3,175	3,175	0	5,653	0	0	1,878	Rest Rotation
Canadian Bench	1,592	0	0	0	0	0	0	0	0	1,592	0	Season Long
Clevenger	638	0	0	639	0	0	0	0	638	0	0	Closed
Cotter Pond	197	0	0	0	0	0	0	197	0	0	40	Season Long
Cyrus	9,325	2,311	0	414	0	0	0	9,325	0	0	1,878	Rest Rotation
Devine	80	0	0	0	0	0	0	80	0	0	7	Season Long
Fox/Dump	6,225	2,565	548	0	351	351	0	6,225	0	0	1,641	Rest Rotation
Goldmine/Falls	720	812	0	0	0	0	0	0	720	0	0	Closed
Gorge	1,182	0	0	0	214	214	0	1,182	0	0	142	Deferred Rotation
Grizzly	9,179	1,664	0	0	0	0	0	9,179	0	0	2,348	Rest Rotation
Haystack	4,835	708	0	0	0	0	0	4,835	0	0	1,784	Short Duration
Holmes-Williams	2,620	386	257	0	0	0	0	2,620	0	0	411	Straight Rotation
Juniper Butte	2,719	1388	0	0	701	701	0	2,719	0	0	430	Deferred Rotation
Kennedy	700	730	0	0	0	0	0	700	0	0	264	Season Long
Lone Pine	9,222	2,325	718	321	272	272	0	9,222	0	0	1,878	Rest Rotation
Lower Desert	10,190	1,765	2,172	0	0	0	0	0	0	10,190	0	Rest Rotation
East Winter	1,521	0	0	0	0	0	0	1,521	0	0	83	Straight Rotation
North	10,251	1,671	621	1,905	484	484	0	10,251	0	0	2,802	Rest Rotation
Peninsula	1,680	1,226	0	526	0	0	0	0	1,680	0	0	Closed
Round Butte	2,494	1,014	0	362	0	0	488	2,494	0	0	423	Rest Rotation
Rush	6,497	2,214	0	0	1,751	1,751	0	6,497	0	0	1,614	Rest Rotation
Squaw Cr. Pasture	5,195	549	0	1,752	0	0	0	0	5,195	0	0	Closed
Steer	2,291	923	0	0	1,396	1,396	0	2,291	0	0	533	Deferred Rotation
Weaning Pasture	238	0	0	0	0	0	0	238	0	0	20	Season Long
Other		892	0	0	0	0	0	0		0	0	N/A
TOTALS	**102,938**	**27,095**	**5,196**	**7,510**	**8,344**	**8,344**	**488**	**82,923**	**8,233**	**11,782**	**20,289**	

Table 2-2A Alternative C - Degree Actions Address Stated Needs

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
GRAZING - Authorize livestock grazing on approximately 82,923 acres of Grassland owned public lands on 19 allotments. The upper limit for authorized livestock stocking would be 20,289 AUMs.					
Manage two allotments (Gorge and Steer) under a form of deferred rotation grazing.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short and mid stubble heights.	Does not address need.
Manage two allotments (East Winter and Holmes-Williams) under a straight rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on all pastures grazed. Provides habitat for birds preferring mid stubble heights.	Does not address need.
Manage the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system (which has been practiced successfully here in the past).	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
Manage the New Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a deferred rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short and mid stubble heights.	Does not address need.
Manage the following ten allotments: Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush under a rest rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides maximum organic matter on the soil surface on rest pastures; over minimum organic matter on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short, mid and tall stubble heights.	Does not address need.
Manage five allotments/pastures (Canadian Bench, Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons).	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
Close four allotments/pastures (Clevenger, Goldmine/Falls, Squaw Creek Pasture of the Holmes – Squaw Creek Allotment, and the Peninsula Allotments) 8,233 acres of Grassland administered lands, to livestock grazing	Does not address need.	Does not address need.	Does not address need.	Provides maximum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only tall stubble heights.	Fully meets need.

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
Manage two existing allotments (Canadian Bench and Lower Desert) as forage reserves totaling approximately 11,782 acres of Grassland administered public lands. Forage reserves would provide places for Grassland permitted livestock to graze while their permitted allotments are being rehabilitated. Use of a forage reserve would be temporary and on an "as needed" basis.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	When not in use (majority of the time): Provides maximum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only tall stubble heights. When in use: Provides over minimum organic matter on the soil surface on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short and mid stubble heights.	Does not address need.
JUNIPER TREATMENT- Density management and control of approximately 50,000 acres of western juniper over the next 10 years using chainsaw cutting and prescribed fire.					
Chainsaw felling of approximately 27,095 acres.	Moves juniper density and distribution toward historic ranges by the magnitude described in the action.	Approximately 4,000 acres of this action is pretreatment for seeding activities designed to address this need.	Does not address need.	Does not address need.	Does not address need.
Chainsaw felling followed by low intensity prescribed fire seven plus years following felling (FEIS, Chapter 2, Section 2.5) of approximately 5,196 acres.	Moves juniper density and distribution toward historic ranges by the magnitude described in the action. Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
Prescribed burning approximately 7,510 acres.	Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
Mechanically treating approximately 488 acres. Mechanical treatment would utilize brush beater or shrub mowing equipment that would treat small-sized canopies such as sapling juniper/sagebrush.	Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
SEEDING/TILLING/FERTILIZING - Rehabilitate 8,344 acres of stagnant "old" crested and tall wheatgrass seedings over the 10 year planning period. Of the 8,344 acres proposed to be "treated" only approximately half, or about 4,000 acres, would actually be tilled and seeded. The objective is to create a mosaic of cover types, leaving sagebrush islands within the treatment areas.					
Removing post settlement aged juniper (included as part of the 27,095 acres proposed for chainsaw felling only juniper treatment).	Moves juniper density and distribution toward historic ranges by the magnitude described in the action.	Approximately 4,000 acres of this action is pretreatment for seeding activities designed to address this need.	Does not address need.	Does not address need.	Does not address need.
Remaining untreated areas would be left within the 8,344 "treated" acres creating a mosaic of sagebrush and	Retention of untreated areas would maintain approximately 4,000 acres of sagebrush steppe.	Retention of untreated areas would maintain approximately 4,000 acres of desirable native	Does not address need.	Does not address need.	Does not address need.

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
tilled/seeded acres.		vegetative species for volunteer establishment into treatment areas over time.			
Rangeland drilling (to a depth of 1-3 inches) using a rangeland drill pulled by a farm or crawler tractor.	Does not address need.	Provides for addressing need across 8,344 acres.	Does not address need.	Does not address need.	Does not address need.
Broadcast seeding.	Does not address need.	Provides for addressing need across 8,344 acres.	Does not address need.	Does not address need.	Does not address need.
Fertilizing where needed (approximately 4,170 acres depending upon soil analysis results).	Does not address need.	Provides for addressing need across 8,344 acres.	Does not address need.	Does not address need.	Does not address need.

2.3.4 Alternative D

Alternative D was created as a result of the analysis of: comments received during scoping, additional review, and analysis of proposed treatment activities. Analysis of comments received during scoping resulted in the elimination of the forage reserves. A review of past vegetation activities, (prescribed burning, past juniper cutting, wildfire, and land management activities on adjacent lands) resulted in a reduction in the number of acres proposed for juniper control.

This alternative addresses:

- Issue 1 - "…livestock use can cause downward ecological trends."
- Issue 2 - "…potential to increase the amount and distribution of noxious weeds and invasive plants."
- Issue 3 - "…potential to affect water quality and quantity by changing upland and riparian vegetative cover and complexity."
- Issue 4 - "…may affect the quality, quantity, and distribution of wildlife habitat, specifically mule deer and pronghorn LRMP designated winter range."
- Issue 5 - "…juniper to be controlled…"

Table 2-3 displays management activities by allotment proposed under this alternative. Included are proposed vegetation management activities and grazing related actions (Map 10 - Alternative D). Appendix E "Alternatives C and D Vegetation Treatment Project Descriptions", displays unit specific information including: unit size, prescription, and expected change in seral condition.

2.3.4.1 Grazing

Authorize livestock grazing on approximately 88,085 acres of Grassland owned public lands on 20 allotments (Map 10 - Alternative D). The upper limit for authorized livestock stocking would be 20,983 AUMs. Actual numbers and length of grazing would be dependant upon meeting utilization standards (FEIS, Chapter 2, Section 2.4.1). New allotment management plans would be written and new permits would be issued.

The implementation of the following livestock management activities would occur under Alternative D:

- Manage two allotments (Gorge and Steer) under a form of deferred grazing.

- Manage one allotment (Holmes-Williams) under a straight rotation grazing system.

    - The Holmes Pasture in the Holmes-Squaw Creek Allotment would be combined with the Williams Allotment. The new allotment, named the Holmes-Williams Allotment, would have two pastures, encompassing 2,620 acres. This allotment is within the Metolius Deer Winter Range and as such the livestock would be off of the allotment prior to August 1. The Squaw Creek Pasture (5,195 acres) would remain closed to grazing (Map 10 - Alternative D). The Squaw Creek Pasture has been eliminated from grazing, as it excludes livestock grazing from the bull trout habitat within Squaw Creek. Bitterbrush is a key wildlife browse species on the winter range. Monitoring of livestock's annual use of bitterbrush would be required. Monitoring would assure that sufficient bitterbrush leaf and leader growth is left following livestock grazing for deer browse and for shrub health (FEIS, Chapter 2, Section 2.4.3). Domestic livestock use would generally not be allowed after August 1 to eliminate potential conflicts between livestock and mule deer needs.

- Divide the Juniper Butte Allotment into two new allotments: Juniper Butte to the west and Haystack to the east. They would have 5 and 12 pastures and 2,719 and 4,835 acres respectively. Highway 97 would be the dividing line between the two allotments. This change is proposed, as Highway 97 has no livestock crossings. Any attempt to move livestock across this busy highway is dangerous to the livestock, operators, and the public driving on the highway. Presently two different permittees graze these two sides of the allotment.

    - Manage the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system (which has been practiced successfully here in the past). The permittee on this allotment has exceeded the minimum stubble heights (taller stubble than the standard requires) on over 75 percent of his pastures over the past four years. On the remaining 25 percent of the allotment the stubble height standards has been consistently meet.

    - Manage the new Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a rest rotation grazing system.

- Manage the following ten allotments: Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush under a rest rotation grazing system. This action would improve the accumulation of soil, organic matter needed to: enhance deep-rooted native perennial grass recruitment, increase the diversity of stubble height retained for wildlife, and aid the vigor of existing plants. Crested wheatgrass pastures may or may not be rested depending on native bunchgrass presence, as the risk of creating very unpalatable grass exists if crested wheatgrass is rested too much. Rest-rotation grazing is similar to deferred rotation grazing but includes the addition of a rest pasture. The rest pasture is rested from grazing for an entire grazing season. Each pasture is rested from grazing for an entire grazing/growing season once during each rotation period (number of years to cycle through all rotation sequences of a grazing rotation). The rest period gives grazed plants additional time to store carbohydrates, regain vigor, and produce litter that will contribute to the organic matter in the soil that may be needed to promote upward ecological trends. The rest pasture also leaves part of each allotment with the full growth of grass at the end of season, providing desirable habitat for ground nesting birds. Even though crested wheatgrass pastures may not be rested, at least one native grass pasture or seeding (pasture) per allotment will be rested each year.

    - The Mud Springs Pasture boundary fence on the Fox Allotment would be realigned to improve livestock use and distribution, and to relieve grazing pressure on the Mud Springs Flat area at the end of the authorized season of use. Approximately two miles of three-strand wire fence would be constructed above the rimrock west of Mud Springs Creek Flat. Approximately one-half mile of old fence would be removed by hand (Map 14 - Proposed Fence Location Changes for Alternative C and D).

    - Approximately 6,683 acres of Grassland administered lands in the Lower Desert Allotment would be open to grazing but managed in such a way as to maintain and/or enhance the quality of mule deer winter range forage. Mule deer winter range requirements and needs would have priority over the provision of forage for domestic livestock. Livestock grazing would be utilized to maintain or improve deer browse and forage opportunities. Bitterbrush is a key wildlife browse species in the winter range. Monitoring of annual use of bitterbrush would be required (FEIS, Chapter 2, Section 2.4.3). Monitoring would assure that sufficient bitterbrush is left following livestock grazing for deer and shrub health. Season of use for domestic livestock

would generally not be allowed after August 1 in order to eliminate potential conflicts between livestock and mule deer needs (FEIS, Chapter 2, Section 2.4.3).

  - Construct approximately 15 miles of new three-wire fence line in the Lower Desert Allotment.

- Manage four allotments/pastures (Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons)

- Manage the Canadian Bench Allotment (1,592 acres of Grassland administered lands) as a vacant allotment under this alternative. There is currently no demand for this allotment due to its lack of boundary fences and water developments.

- Close part or all of five allotments/pastures (Clevenger, Goldmine/Falls, Squaw Creek Pasture of the Holmes – Squaw Creek Allotment, portions of Lower Desert, and the Peninsula Allotments) 13,261 acres of Grassland administered lands to livestock grazing (Map 10 - Alternative D and Table 2-3 Alternative D - Proposed Management Actions).

  - The portions of the Lower Desert Allotment proposed to be closed to grazing are located on private lands that historically were included in the allotment. Today the private land ownership has changed and the feasibility of grazing within the Grassland administered allotment is now questionable.

  - Two cattleguards would be removed from closed allotments using a backhoe.

The Gray Butte Grazing Association would continue to be responsible for the maintenance of the following rangeland improvements which would remain on the Grassland:

- Approximately 750 miles of existing fences including approximately 550 miles of allotment boundary fence and 200 miles of division fence.
- Approximately 17 miles of new boundary and division fence.
- Approximately 30 road cattleguards.
- Approximately 100 miles of buried water pipelines.
- 29 wells.
- 175 livestock/wildlife water developments.

2.3.4.2 Juniper Treatment and Seeding/Tilling/Fertilizing

The following activities are also included under Alternative D:

- Density management and control of approximately 29,590 acres of western juniper over the next 10 years using chainsaw cutting and prescribed fire (Map 10 - Alternative D, and Table 2-3 Alternative D - Proposed Management Actions).
  - Chainsaw felling of approximately 10,800 acres.
  - Chainsaw felling followed by low intensity prescribed fire seven plus years following felling (FEIS, Chapter 2, Section 2.5.2) of approximately 5,200 acres.
  - Prescribed burning approximately 4,760 acres.
  - Mechanically treating approximately 490 acres. Mechanical treatment would utilize brush beater or shrub mowing equipment that would treat small-sized canopies such as sapling juniper/sagebrush.

- Rehabilitate 8,350 acres of stagnant "old" crested and tall wheatgrass seedings over the ten-year planning period (Map 10 - Alternative D). Of the 8,350 acres proposed to be "treated" only approximately half, or about 4,000 acres, would actually be tilled and

seeded. The objective is to create a mosaic of cover types, leaving sagebrush islands within the treatment areas. Refer to the Project Design Criteria and Monitoring Common to Alternatives C and D (Section 2.5.7) later in Chapter 2 for seeding detail. These projects would include:

- Removing post settlement aged juniper (included as part of the 10,800 acres proposed for chainsaw felling only juniper treatment).
- Remaining untreated areas would be left within the 8,350 "treated" acres creating a mosaic of sagebrush and tilled/seeded acres.
- Tilling (to 10 inch soil depth) using a farm or crawler tractor pulling rangeland discs.
    - Where tilling is planned to occur, all post settlement age juniper (less than 80 year old juniper) would be removed prior to tilling. Occasional large junipers that provide diversity to an early seral (grass and shrub) landscape would be left. For the purpose of this analysis we have defined post settlement junipers as those juniper trees that were established since 1920.
- Rangeland drilling (to a depth of 1-3 inches) using a rangeland drill pulled by a farm or crawler tractor.
- Broadcast seeding.
- Fertilizing where needed (approximately 4,170 acres depending upon soil analysis results).
    - The type of fertilizer would likely be a 16-16-16-20 (Nitrogen-Phosphorous- Potassium-Sulfur) formulation, with trace elements dependent upon soil analysis results.
    - Application would be by ground-based equipment at a rate of 100 to 200 pounds per acre (depending upon soil analysis results).

2.3.4.3 Comparison to Proposed Action

As compared to the Proposed Action, Alternative D **does not** propose the following actions:

- Establishment of forage reserves.
    - The forage reserves (a portion of Lower Desert and Canadian Bench Allotments under Alternative C) were dropped because of conflicts with proposed Oregon Department of Fish and Wildlife California bighorn sheep transplants to the Deschutes River Canyon and because of concerns of local residents living within the allotments regarding: domestic sheep grazing practices, weed introduction, conflicts between livestock and private land owners, and the perspective that stocking should be reduced rather than moving livestock with rehabilitating portions of allotments .

Table 2-3 (below) displays management activities by allotment proposed to continue under this alternative, while Table 2-3A following displays how the alternative actions address the needs (FEIS, Chapter 1, Section 1.4.2).

Table 2-3 Alternative D - Proposed Management Actions

GRAZING ALLOTMENT		PROPOSED TREATMENT ACRES						PROPOSED GRAZING ACTIONS				
NAME	ACRES	Juniper Control-with Chainsaw	Juniper Control-Chainsaw/ Prescribed Fire	Sagebrush/ Juniper Control-Prescribed Fire	Juniper Control with Seeding	Seeding	Mechanical Treatment of shrubs - Fuel Break	Open to Grazing	Closed to Grazing	Vacant Allotment	Authorized AUMs	Grazing System
Blanchard	7,694	1,877	880	1,591	0	0	0	7,694	0	0	2,113	Rest Rotation
Boyce	5,653	0	0	0	3,175	3,175	0	5,653	0	0	1,878	Rest Rotation
Canadian Bench	1,592	0	0	0	0	0	0	0	0	1,592	332	Vacant
Clevenger	638	0	0	0	0	0	0	0	638	0	0	Closed
Cotter Pond	197	0	0	0	0	0	0	197	0	0	40	Season Long
Cyrus	9,325	925	0	414	0	0	0	9,325	0	0	1,878	Rest Rotation
Devine	80	0	0	0	0	0	0	80	0	0	7	Season Long
Fox/Dump	6,225	887	548	0	351	351	0	6,225	0	0	1,641	Rest Rotation
Goldmine/Falls	720	0	0	0	0	0	0	0	720	0	0	Closed
Gorge	1,182	0	0	0	214	214	0	1,182	0	0	142	Deferred Rotation
Grizzly	9,179	509	0	0	0	0	0	9,179	0	0	2,348	Rest Rotation
Holmes-Williams	2,620	386	257	0	0	0	0	2,620	0	0	411	Deferred Rotation
Squaw Creek Pasture	5,195	549	0	0	0	0	0	0	5,195	0	0	Closed
Juniper Butte	2,719	1388	0	0	701	700	0	2,719	0	0	430	Rest Rotation
Haystack Butte	4,835	708	0	0	0	0	0	4,835	0	0	1,784	Short Duration
Kennedy	700	0	0	0	0	0	0	700	0	0	264	Season Long
Lone Pine	9,222	1,038	718	321	272	272	0	9,222	0	0	1,878	Rest Rotation
Lower Desert	11,711	0	2,172	0	0	0	0	6,683	5,028	0	445	Rest Rotation
North	10,251	1,671	621	1,905	484	484	0	10,251	0	0	2,802	Rest Rotation
Peninsula	1,680	0	0	526	0	0	0	0	1,680	0	0	Closed
Round Butte	2,494	476	0		0	0	488	2,494	0	0	423	Rest Rotation
Rush	6,497	389	0	0	1,751	1,751	0	6,497	0	0	1,614	Rest Rotation
Steer	2,291	0	0	0	1,396	1,396	0	2,291	0	0	533	Deferred Rotation
Weaning Pasture	238	0	0	0	0	0	0	238	0	0	20	Season Long
TOTALS	**102,938**	**10,803**	**5,196**	**4,757**	**8,344**	**8,343**	**488**	**88,085**	**13,261**	**1,592**	**20,983**	

Table 2-3A Alternative D - Degree Actions Address Stated Needs

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
GRAZING - Authorize livestock grazing on approximately 88,085 acres of Grassland owned public lands on 20 allotments. The upper limit for authorized livestock stocking would be 20,983 AUMs.					
Manage two allotments (Gorge and Steer) under a form of deferred rotation grazing.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short and mid stubble heights.	Does not address need.
Manage one allotment (Holmes-Williams) under a straight rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides over minimum organic matter on the soil surface on all pastures grazed. Provides habitat for birds preferring mid stubble heights.	Does not address need.
Manage the new Haystack Allotment (Juniper Butte east of Hwy 97) under a short duration grazing system (which has been practiced successfully here in the past).	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
Manage the New Juniper Butte Allotment (Juniper Butte west of Hwy 97) under a rest rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides maximum organic matter on the soil surface on rest pastures; over minimum organic matter on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short, mid and tall stubble heights.	Does not address need.
Manage the following ten allotments: Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush under a rest rotation grazing system.	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides maximum organic matter on the soil surface on rest pastures; over minimum organic matter on pastures grazed early and minimum organic matter on pastures grazed later in the season. Provides habitat for birds preferring short, mid and tall stubble heights.	Does not address need.
Manage four allotments/pastures (Cotter Pond, Devine, Kennedy, and Weaning) under a season long grazing system (one pasture with short grazing seasons).	Does not address need.	Does not address need.	Meets need to the magnitude described in the action.	Provides minimum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only short stubble heights.	Does not address need.
Manage the Canadian Bench Allotment (1,592 acres of Grassland administered lands) as a vacant allotment under this alternative.	Does not address need.	Does not address need.	Provides potential to provide grazing on this allotment in the future.	While vacant, provides maximum organic matter on the soil surface on all pastures. Provides habitat for birds preferring only tall stubble heights.	Does not address need.
Close part or all of five allotments/pastures (Clevenger,	Does not address need.	Does not address need.	Does not address need.	Provides maximum organic matter on the soil surface on all	Fully meets need.

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
Goldmine/Falls, Squaw Creek Pasture of the Holmes – Squaw Creek Allotment, portions of Lower Desert, and the Peninsula Allotments) 13,261 acres of Grassland administered lands, to livestock grazing.				pastures. Provides habitat for birds preferring only tall stubble heights.	
JUNIPER TREATMENT- Density management and control of approximately 29,588 acres of western juniper over the next 10 years using chainsaw cutting and prescribed fire.					
Chainsaw felling of approximately 10,803 acres.	Moves juniper density and distribution toward historic ranges by the magnitude described in the action.	Approximately 4,000 acres of this action is pretreatment for seeding activities designed to address this need.	Does not address need.	Does not address need.	Does not address need.
Chainsaw felling followed by low intensity prescribed fire seven plus years following felling (FEIS, Chapter 2, Section 2.5) of approximately 5,196 acres.	Moves juniper density and distribution toward historic ranges by the magnitude described in the action. Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
Prescribed burning approximately 4,757 acres.	Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
Mechanically treating approximately 488 acres. Mechanical treatment would utilize brush beater or shrub mowing equipment that would treat small-sized canopies such as sapling juniper/sagebrush.	Potential to maintain sagebrush steppe by the magnitude described in the action, but decrease big sagebrush cover.	Does not address need.	Does not address need.	Does not address need.	Does not address need.
SEEDING/TILLING/FERTILIZING - Rehabilitate 8,344 acres of stagnant "old" crested and tall wheatgrass seedings over the 10 year planning period. Of the 8,344 acres proposed to be "treated" only approximately half, or about 4,000 acres, would actually be tilled and seeded. The objective is to create a mosaic of cover types, leaving sagebrush islands within the treatment areas.					
Removing post settlement aged juniper (included as part of the 27,095 acres proposed for chainsaw felling only juniper treatment).	Moves juniper density and distribution toward historic ranges by the magnitude described in the action.	Approximately 4,000 acres of this action is pretreatment for seeding activities designed to address this need.	Does not address need.	Does not address need.	Does not address need.
Remaining untreated areas would be left within the 8,344 "treated" acres creating a mosaic of sagebrush and tilled/seeded acres.	Retention of untreated areas would maintain approximately 4,000 acres of sagebrush steppe.	Retention of untreated areas would maintain approximately 4,000 acres of desirable native vegetative species for volunteer establishment into treatment areas over time.	Does not address need.	Does not address need.	Does not address need.
Rangeland drilling (to a depth of 1-3 inches) using a rangeland drill pulled by a farm or crawler tractor.	Does not address need.	Provides for addressing need across 8,344 acres.	Does not address need.	Does not address need.	Does not address need.
Broadcast seeding.	Does not address need.	Provides for addressing need across 8,344 acres.	Does not address need.	Does not address need.	Does not address need.
Fertilizing where needed	Does not address need.	Provides for addressing need	Does not address need.	Does not address need.	Does not address need.

ACTIONS	PARAPHRASED NEEDS ADDRESSED				
	Move juniper density and distribution closer to HRV and maintain sagebrush steppe.	**Promote succession on old seedings toward HRV.**	**Continue livestock grazing.**	**Provide a diversity of year end stubble heights for organic matter and bird habitat.**	**Close livestock grazing on three allotments and one pasture of another allotment.**
(approximately 4,170 acres depending upon soil analysis results).		across 8,344 acres.			

2.4 Project Design Criteria and Monitoring Common to Action Alternatives B, C, and D

Project Design Criteria (PDCs) guide the design and implementation of the proposed actions to mitigate or minimize adverse impacts.

2.4.1 Grazing Management

The "Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands within the Deschutes and Ochoco National Forests 2003-2006" (USDA/USDI 2003) provides project design criteria for grazing activities which are listed below:

- Exclude livestock from streams with bull trout spawning habitat from January 1 to May 15 and from August 15 to December 31 each year to protect bull trout. Exclude livestock from streams with steelhead spawning habitat from February 15 to July 15. Over the past 20 years, over 90 percent of the riparian areas have been fenced from livestock use on the Grassland.

- Conduct pasture moves before the alteration condition threshold (trigger) is reached or before the forage stubble height threshold is reached (see below).

- Monitor utilization using stubble height. Livestock would be moved from each pasture prior to meeting stubble height standards. Table 2-4 displays the stubble height standard for each key species and the dates for which each standard is appropriate.

Table 2-4 Forage Stubble Height Standards (Utilization)

Species	Date	Stubble Height (Inches)
Crested/Bluebunch Wheatgrass, Whitmar	Before June 1	3
	After June 1	4
Idaho Fescue	Before June 1	3
	After June 1	4
Kentucky Bluegrass	Before June 1	2
	After June 1	2

Also use stubble height as the year-end target. Year-end target guidelines are used to make management adjustments and meet project design criteria contained in the "Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands within the Deschutes and Ochoco National Forests 2003-2006" (2003). Table 2-5 displays the standard used for each species.

Table 2-5 Year-End Stubble Height Standards (Utilization)

Species	Stubble Ht (Inches)
Crested/Bluebunch Wheatgrass, Whitmar	4
Idaho Fescue	4
Kentucky Bluegrass	2

- Make next year adjustments where standards have not been met and unsatisfactory conditions are attributed to livestock. Adjust:

- The grazing regime (resting pastures, adjusting rotations, increasing stubble height, or creating riparian pastures/exclosures).
- Operational management standards (reduction in numbers, requiring a full time rider, or reduction in duration).

Separate consultation is required in cases (e.g., specific allotments) where the standards are not met for two consecutive years.

- Monitor 100 percent of Category 1 pastures (Category I: All USFS/BLM projects that are associated with any RHCA that occurs entirely or partially within a 6th field HUC/subwatershed containing ESA-listed fish species (salmon, steelhead, bull trout) or designated or proposed critical habitat.), and a minimum of 35 percent of Category II pastures (Category II: All USFS/BLM projects associated with any RHCA that occurs entirely or partially within a 6th field HUC/subwatershed that does not contain ESA-listed fish species (salmon, steelhead, bull trout) or designated or proposed critical habitat).

- Conduct long term monitoring using the ecological site plots established by the National Resource Conservation Service (NRCS) in 2001. A random percentage of the plots would be re-visited and reviewed for ecological trend in 2011 (as monitoring budgets allow). Condition and Trend transects would be re-read. Attainment of these goals is dependent upon annual monitoring budgets.

- Conduct long-term monitoring using the methods described above to evaluate ecological trend by measuring plant composition. If this data indicates a downward trend make management changes to promote a static or upward ecological trend.

2.4.2 Water Quality/Fisheries

- Manage seeps and springs using Class III and IV RHCA protective buffers as specified in Inland Native Fish Strategy Environmental Assessment (INFISH, 1995). Over the past 20 years over 90 percent of the riparian areas have been fenced from livestock use on the Grassland.

2.4.3 Wildlife

- Give priority to mule deer winter range requirements and needs over the provision of forage for domestic livestock within designated Metolius Mule Deer Winter Range. Livestock grazing would be utilized to maintain or improve deer browse and forage opportunities. Bitterbrush is a key wildlife browse species in the winter range. Monitoring of annual use of bitterbrush would be required. Monitoring would assure that sufficient bitterbrush is left following livestock grazing for deer and shrub health.

- Limit the general season of use for domestic livestock within Metolius Mule Deer Winter Range to prior to August 1 in order to eliminate potential conflicts between livestock and mule deer needs. Climatic conditions could require earlier removal of livestock at the direction of a Forest officer. Climatic conditions could also allow an extension of season after August 1 following a written request and Forest officer approval.

2.5 Project Design Criteria and Monitoring Common to Alternatives C and D

Project Design Criteria (PDCs) guide the design and implementation of the proposed actions to mitigate or minimize adverse impacts.

2.5.1 Cultural Resources

- Avoid "viable cultural plant populations" (i.e., a patch of lomatium of ¼ acre or more) or cultural plant habitats (scab flats) when encountered during vegetation management project planning, layout, or execution (Currim, CTWSR, 2003**).**

- Survey all areas with a high probability of containing cultural properties which are located in undisturbed areas within proposed seeding and prescribed fire treatment units before beginning the project.

- Survey twenty percent of the 8,100 acres of cultural plant high probability habitat within old soil stabilization seedings and proposed for either re-seeding or prescribed fire treatment prior to before beginning the project.

- Avoid known cultural properties, both eligible and potentially eligible for the National Register of Historic Properties (NRHP), located within seeding treatment units. Avoid known cultural properties within prescribed fire treatment units if temperatures would exceed 400 degrees Celsius and the site has not been burned historically.

- Prior to implementing any ground disturbing project, an archaeologist will review the project to insure protection of cultural values.

2.5.2 Prescribed Burning

- Require lopping and scattering of branches in juniper stocking control projects unless the area is going to be tilled and seeded. Remove cut juniper from the site where tilling and seeding is to occur and either pile, or lop and scatter the juniper where it is deposited.

- Do not burn or remove any biological old growth juniper (pre-settlement) encountered during vegetation treatment planning and layout.

- Do not burn or cut in designated old growth areas.

- Delay post treatment prescribed burning within juniper stocking control projects for approximately seven years unless such a delay will not meet fuels or seeding objectives.

- Delay burning existing sagebrush stands until replacement stands have been restored through western juniper stocking control treatments.

2.5.3 Grazing Management

- Rest seeded areas for a minimum of two growing seasons to provide for sufficient rest from domestic livestock grazing to assure seedling establishment and rooting.

- Rest after prescribed burns for a minimum of two growing seasons (not including slash pile burning). The length of the period of rest will depend upon:
    - Pre-fire ecological condition.
    - Post prescribed burn conditions and results.
    - Size of prescribed burn in relation to entire pasture size.
    - Vegetative response to the prescribed fire.

  A Forest officer will approve re-initiation of livestock grazing in coordination with the Grassland wildlife biologist and range conservationist.

- Determine whether or not to rest pastures where crested wheatgrass is identified as the key species during the implementation of a rest-rotation grazing plan at the discretion of the Grassland. Too much rest of crested wheatgrass creates an unpalatable plant that becomes "wolfy" and stagnant. Minimum stubble height standards may be adjusted to meet specific ecological, structural or pasture needs. For example, on a given year a pasture dominated by crested wheatgrass that has not been grazed early for two or three years may require early intense grazing in order to return palatability to the forage and vigor to the stand. In this case a two-inch stubble height early in the season (versus three inch stubble height) may be prescribed. This non-rest of a planned rest pasture is estimated to occur on two pastures per year out of a possible 80 pastures or approximately two percent of the grazed acres. In the event that a crested wheatgrass pasture is not rested, a native grass or seeding pasture will be rested instead. Therefore, in all allotments with a rest rotation system one pasture will be rested each year.

- Protect livestock control fences, cattleguards, and other structural range improvements during vegetative treatments. Restore all structural range improvements damaged during treatment activities to pre-treatment condition.

- Identify on the ground, and protect Condition & Trend plots before and during treatment activities.

2.5.4 Non-native Invasive Weed Species

- Provide weed identification materials for all personnel who would be preparing, implementing, and/or administering the proposed actions.

- Document weed infestations identified during implementation.

- Require weed propagule free equipment on all projects including but not limited to seeding, tilling, fertilizing, juniper cutting, prescribed burning, and mechanical brush treatment.

- Use seed certified as "All-States Noxious Weed Free" by an approved testing laboratory (such as the Oregon State University Seed Lab) in rehabilitation projects.

- Obtain mineral material (i.e. gravel) used for reinforcement around troughs or ponds from weed-propagule free sources.

- Maintain a Grassland invasive plant species inventory. Update the inventory annually. Use this inventory as a prevention measure during project planning, layout, and execution. Use the inventory to identify/verify sites and to plan either avoidance or minimized and mitigated disturbance.

- Conduct pre and post-project surveys to document existing infestations and to evaluate the effects of projects on noxious weed infestations.

- Obtain water for: prescribed or wildfire control, watering roads, or other activities, from sites certified and maintained to be free from noxious weed propagules.

2.5.5 Old Growth (pre-settlement) Western Juniper Management

- Do not cut, burn, or otherwise remove, any biological old growth juniper (pre-settlement) encountered during vegetation treatment planning and layout.

- Do not conduct treatment in designated and biological old growth areas.

2.5.6 Recreation

2.5.6.1 Developed Sites:

- Meet the Recreation Opportunity Spectrum (ROS) classifications for treatments planned for campgrounds (see Table 2-5A). Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil. Treatments within any developed campgrounds will maintain shade and vegetative screening between campsites.

- Maintain a visual quality objective (VQO) of "Retention", where human activities (treatments) will not be evident to the casual forest visitor for vegetative treatments planned adjacent to developed recreation facilities.

Table 2-5A Developed Site Summary

Developed Site Name	Site Type	ROS	VQO	Watershed
Haystack Reservoir	Campground	Rural	Retention	Deschutes South
Cyrus Horse Camp	Horse Camp	Roaded Natural	Retention	Deschutes South
Skull Hollow	Primitive Campground	Roaded Natural	Retention	Lower Crooked River Valley
Rimrock Springs	Trailhead	Rural	Retention	Willow Creek
Gray Butte	Trailhead	Roaded Natural	Retention	Crooked River Grasslands
Alder Springs	Trailhead	Semi-Primitive Non-Motorized	Retention	Whychus
Henderson Flat OHV	Trailhead	Roaded Natural	retention	Crooked River Grasslands

2.5.6.2 Trails

- Maintain a mosaic of tree cover for shade, and the visual variety of the landscape with juniper thinning and/or prescribed burning planned over or adjacent to constructed trail features. If existing trees and vegetation along trail corridors where the vegetation providing management control is removed, other management control devices will be constructed. This could be through placement of boulders, bollards, or split rail fencing.

- Reconstruct trail tread that is impacted by tilling, seeding, or vegetative treatments to Forest Service standards and specifications,

- Remove and pile out of sight (a minimum of 50 feet away from the trail on either side of the trail corridor) slash from juniper thinning along trails.

- Meet the Recreation Opportunity Spectrum (ROS) classifications as defined for the management area within the LRMP for all vegetative treatments along trail corridors (see Table 2-5A and Table 2-5B).

- Do not place salt for livestock near trails.

- In the Henderson Flat OHV area, maintain the effectiveness of management of the trail system, by limiting the removal of juniper of any size adjacent to designated trails

2.5.6.3 Dispersed Sites

- Meet the Recreation Opportunity Spectrum (ROS) classifications as defined for the management area and Visual Quality Objective of Retention (see Table 2-5A and Table 2-5B) for treatment of areas directly adjacent to dispersed sites.

- Remove, pile out of sight, and burn slash from juniper thinning around dispersed sites in order to meet the VQO of Retention.

Table 2-5B Trail Summary

Trail Name & No.	Mileage	Type Use	ROS	Watershed(s)
Gray Butte #852	6.0	Mountain Bike, Hiker, Horse,	Roaded Natural	Deschutes South, Crooked River Grasslands
Rimrock #851	1.5	Hiker only	Roaded/ Semi-Primitive Non-Motorized	Willow Creek
Ridge Rider #854	20	Hiker, Mountain Bike, Horse,	Roaded Natural	Deschutes South, Lower Crooked River Valley, Crooked River Grasslands, Willow Creek
Henderson Flat OHV Trail System #853	17.0	Off-Highway Vehicle, Mountain Bike, Horse, Hiker	Roaded Natural	Crooked River Grasslands
Alder Springs #855	4.0	Hiker only	Semi-Primitive Non-Motorized	Whychus
Old Bridge #855A	0.25	Hiker only	Semi-Primitive Non-Motorized	Whychus
Tam-a-lau #856	6.0	Hiker (horse and mountain bike use allowed on peninsula segment only)	Semi-Primitive Non-Motorized	Lake Billy Chinook

2.5.6.4 Middle Deschutes and Lower Crooked Wild and Scenic River Corridors, Squaw Creek Management Area, Cove Palisade State Park, and Lake Billy Chinook View Area

- Meet the Recreation Opportunity Spectrum (ROS) classifications and Visual Quality Objectives defined in the LRMP and Area/Corridor Management Plans in treatment of areas within or directly adjacent to these river corridors and/or management areas. Evidence of management actions should be removed from view where feasible.

2.5.6.5 Special Use Permits

- Schedule implementation actions so as to reduce or eliminate conflicts with existing or planned permitted uses.

2.5.7 Seeding

2.5.7.1 Trials

- Begin proposed tilling/seeding/fertilization projects as trials. Seeding trials will be designed to test establishment of seeded species, their survival, along with invasive plant species establishment. Success or failure will be assessed three years following seeding. If trials fail, the results will be assessed and procedures changed or adapted and tested before retesting. Prior to full scale tilling and seeding, till/no-till site preparation techniques and various seed mixtures would be tested to determine appropriate techniques and mixtures to be applied to each site. Up to 50 percent of any treated area will actually be seeded. The area will be considered treated when less than half of the area has been seeded. Existing remnant sagebrush stands will be left untreated to create a mosaic of habitats. These islands of sagebrush would provide a seed source for some native plants. Where soil testing suggests that fertilization is necessary, test plots would be established to determine response to various application rates and formulations. Tests would be designed to monitor both, the success of various techniques, mixtures, and formulations, and invasive plant establishment. Trial size will generally be a minimum of ten acres in size (contingent upon costs).

- Utilize protective buffers as specified in Inland Native Fish Strategy Environmental Assessment, (INFISH, 1995) for Class 1, 2, and 3 RHCAs.

- Monitor using paced transects across the treated area. Transects would also be located adjacent to the treated sites as controls for comparison. Surveys using standard Condition and Trend plot sampling procedures would include data on species composition and percent ground cover of seeded, non-native, and invasive annual and perennial species. Other measurement parameters may be added as needed.

- A minimum of five of the trial plots will be seeded with a 100 percent native seed mix within the first five years of implementation. As a goal, at least 1,000 of the 8,344 total treatment acres would be seeded with a 100 percent native seed mix unless the results of the trials show that a 100 percent native seed mix cannot be successfully used or it is cost-prohibitive. On the remaining 7,344 acres a mixture of natives and cultivars will be used.

- Give desirable non-native species priority when trying to restore degraded sites (abandoned farmland, old crested wheatgrass seedings, or weed infested sites such as those dominated by medusahead). No site would be seeded 100 percent to desirable non-native species. A mixture of natives and desirable non-natives would be used. Antelope bitterbrush will be planted at the same time as grasses and forbs in re-seeding projects.

2.5.7.2 Seed Mixtures:

- **Native seed mixtures include:**
    - Locally collected native seed that is increased by a contracted grower.
    - A minimum of five seeding trial plots will be seeded exclusively with native species.
    - Source identified local seed that is locally collected from a broader area and produced for commercial sale by growers

- **Native Seed List**:
    - antelope bitterbrush
    - bluebunch wheatgrass
    - bottlebrush squirreltail
    - Idaho fescue
    - western wheatgrass
    - wildrye
    - Thurber's needlegrass
    - lupine
    - yarrow
    - biscuitroot
    - buckwheat

- **Cultivar/native seed mixtures include:**
    - Source identified local seed that is locally collected from a broader area and produced for commercial sale by growers.
    - Locally collected native seed that is increased by a contracted grower.
    - Cultivars (commercially cultivated varieties) of native species such as Anatone bluebunch, and Sherman big bluegrass (this mixture was used for the development of Table 3-80 located in the Economic discussion (FEIS, Chapter 3, Section 3.15.3.1.2).
        - **Cultivar Seed List**:
            - Antone bluebunch wheatgrass
            - Whitmar beardless bluebunch wheatgrass
            - Sherman big bluegrass
            - biscuitroot
            - buckwheat
            - lupine

- **Exotic Seed List**
    - Crested wheatgrass (used on very degraded sites; it is especially effective when treating sites with invasive plant problems).
    - Clover and range alfalfa (added to seed mixture to enhance nitrogen depleted farmed soils and enhance wildlife forage quality).

2.5.7.3 Timing of Seeding

- Conduct seeding from November through February with rangeland drills. If precipitation for the months of November and December is above "normal" in Central Oregon then the probability of sufficient moisture appears to be higher than in other years. Winter and/or early spring seedings are highly recommended when this weather situation occurs (Eddleman, 2002).

- Rest seeded sites from livestock grazing for two years.

2.5.8 Soils

- Till soils where there is evidence of long-term compaction caused by past livestock and homesteading activities.

- Till a unit on contour across prevailing wind.

- Lop and scatter slash in areas that are not going to be tilled and seeded.

- Allow reservoirs of vesicular arbuscular mychorrhizae (VAM) to persist allowing wind dispersal of seed and spores. Existing islands of sagebrush would be left un-treated while treating rabbitbrush stands. The goal would be to create a sagebrush and grass mosaic.

2.5.8.1 Fertilization

- Test soils prior to beginning seeding projects. Soils in the analysis area are commonly low in nitrogen and sulphur. Other common deficiencies include boron, zinc, and manganese.
- Conduct fertilization trials if, after soil testing, it is determined that fertilization may augment successful seeding. Specific fertilizer and amounts would be determined following lab analysis of selected grab samples in proposed treatment areas. Normally 16-16-16-20 (nitrogen/phosphorus/potassium/sulphur or NPKS) is adequate to remediate soil nutrient problems in this area at a normal rate of 100 to 200 lbs per acre. One hundred pounds/acre would provide 16 lbs each of N, P, and K and 20 lbs of S per acre; 200 lbs/acre would be 32 lbs of N, P, and K and 40 lbs/S/acre.
- Monitor target seeded species establishment and invasive plant species occurrence. Decide whether or not to conduct large-scale fertilization after sufficient trials have been completed.
- Meet LRMP standards and guidelines for detrimental scorching, compaction, and effective ground cover (LRMP 1989 page 4-106-107) during and following prescribed burn operations.

2.5.9 Water Quality

- The location of stream courses, springs, and wet meadows will be delineated and avoided.

2.6 Alternative Comparisons

Table 2-6 displays a comparison of expected outputs by alternative.

Table 2-6 Alternative Comparison Table

VEGETATION TREATMENTS/GRAZING DISPOSITION		ALTERNATIVES			
		A	B	C.	D.
Acres of Juniper Density Control - chainsaw		0	0	27,095	10,803
Acres of Juniper Density Control - chainsaw/prescribed fire		0	0	5,196	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire		0	0	7,510	4,757
Acres of Sagebrush/Juniper cover control - mechanical		0	0	488	488
Acres of Juniper Control as part of seeding treatments - chainsaw		0	0	8,344	8,344
	Total Acres of Juniper Control	0	0	48,633	29,588
	Total Acres of Till/Seed/Fertilize	0	0	8,344	8,344
	Total Acres of Vegetation Treatment	0	0	48,633	29,588
Acres Open to Domestic Livestock Grazing		0	102,938	82,923	88,085
Acres Vacant to Domestic Livestock Grazing		0	0	0	1,592
Acres Closed to Domestic Livestock Grazing		102,938	0	8,233	13,261
Acres in Forage Reserve		0	0	11,782	0
Total Acres		102,938	102,938	102,938	102,938

Table 2-7 (below) summarizes the how each alternative compares to the purpose and needs and issues.

Table 2-7 Comparisons of Purpose & Need Statements and Issues to the Alternatives

Purpose and Needs	Alternative A No Action (No Grazing)	Alternative B Current Management	Alternative C Proposed Action	Alternative D
Purpose & Need 1.4.2.1 - There is a need for the density and distribution of post settlement western juniper to more closely reflect the levels within the historic range of variability, and for the maintenance of existing sagebrush steppe sites where juniper is encroaching.	No treatment proposed and lack of juniper control will not alter current western juniper densities and distribution.	No treatment proposed and lack of juniper control will not alter current western juniper densities and distribution.	48,633 acres of juniper controlled using chainsaw cutting, prescribed fire, and mechanical treatment which will maintain existing, and increase the acreage of early and late seral/structural stages while reducing the acreage of mid seral/structural stages moving closer to the historic range and distribution of seral/structural stages on the Grassland.	29,588 acres of juniper controlled using chainsaw cutting, prescribed fire, and mechanical treatment which will maintain existing, and increase the acreage of early and late seral/structural stages while reducing the acreage of mid seral/structural stages moving closer to the historic range and distribution of seral/structural stages on the Grassland.
Purpose & Need 1.4.2.2 - There is a need for succession to advance on some of the seeded sites (less than 10,000 acres) beyond Sandberg bluegrass dominated sites toward HRV plant associations characterized by deep-rooted native bunchgrasses and forbs under sagebrush and bitterbrush (with a diversity of age classes of sagebrush).	No treatment proposed and lack of seeding will not alter current extremely slow rates of successional progress on some historically farmed sites.	No treatment proposed and lack of seeding will not alter current extremely slow rates of successional progress on some historically farmed sites.	8,344 acres treated by one or all of the following methods: tilling, seeding, and fertilization. Seeding to emphasize native plants where possible, but cultivars and introduced species may be used. This action will increase the rate of succession toward historic plant associates which would have occurred on the treated sites.	8,344 acres treated by one or all of the following methods: tilling, seeding, and fertilization. Seeding to emphasize native plants where possible, but cultivars and introduced species may be used. This action will increase the rate of succession toward historic plant associates which would have occurred on the treated sites.
Purpose & Need 1.4.2.3 - There is a need for continued livestock grazing on the Crooked River National Grassland because of its contribution to the social and economic health of the surrounding area.	No domestic livestock grazing permitted. No new Allotment Management Plans produced. Gray Butte Grazing Association (GBGA) grazing agreement not re-authorized for the next 10-year period.	Livestock Grazing Permit authorized for GBGA with an authorized stocking level of approximately 21,714 AUMs on 23 allotments providing this level of contribution to the social and economic health of the surrounding area.	Livestock Grazing Permit authorized for GBGA with an authorized stocking level of approximately 20,289 AUMs on 19 allotments providing this level of contribution to the social and economic health of the surrounding area.	Livestock Grazing Permit authorized for GBGA with an authorized stocking level of approximately 20,983 AUMs on 20 allotments providing this level of contribution to the social and economic health of the surrounding area.
Purpose & Need 1.4.2.4 - There is a need for a diversity of grass stubble heights (up to 15 inches or higher) at the end of the grazing season. On some of the historically homesteaded and farmed sites organic matter is lacking in and on the soil. Leaving sufficient stubble at the end of the grazing season will aid in the accumulation of organic matter which will aid in the establishment of deep-rooted native grass species. A range of stubble heights would provide habitat for ground nesting birds such as the California quail, western meadowlark, horned lark, and the burrowing owl.	With no grazing of domestic livestock this alternative would provide mostly tall grass stubble at the end of the growing season with little diversity. This would provide the greatest amount of organic matter left on the soil surface. This would provide habitat for ground nesting birds preferring tall grass, such as California Quail and Western meadowlark, but would not provide habitat for ground nesting birds preferring short grass, such as horned lark and burrowing owl. In time, as the sagebrush steppe converts to juniper woodland, a large percentage of the tall bunchgrasses would drop out of the plant community leaving reduced habitat diversity.	Current management prescribes that all pastures be left at a minimum of 4-inch stubble at the end of the grazing season. This limits the desired stubble height diversity. This would provide the least amount of organic matter left on the soil surface. This would provide habitat for ground nesting birds preferring short grass, such as horned lark and burrowing owl, but would not provide habitat for ground nesting birds preferring tall grass, such as California Quail and Western meadowlark. In time, as the sagebrush steppe converts to juniper woodland, a large percentage of the tall bunchgrasses would drop out of the plant community leaving reduced habitat diversity.	Implements rest rotation grazing in 10 allotments. Closes 8,233 acres to grazing. Implements 2 forage reserves on approximately 11,782 acres. Re-grazing would be eliminated on all allotments except the new Haystack Allotment. Ungrazed allotments and pastures would be expected to be similar to Alternative A. Rest rotation grazing would provide a diversity of stubble heights across each allotment due to the changing schedule of grazing and rest. This would provide a mid level of organic matter left on the soil surface. This would provide habitat for ground nesting birds preferring both short grass and tall grass.	Implements rest rotation grazing in 11 allotments. Closes 13,261 acres to grazing. Re-grazing would be eliminated on all allotments except the new Haystack Allotment. Ungrazed allotments and pastures would be expected to be similar to Alternative A. Rest rotation grazing would provide a diversity of stubble heights across each allotment due to the changing schedule of grazing and rest. This would provide a mid level of organic matter left on the soil surface. This would provide habitat for ground nesting birds preferring both short grass and tall grass.
Purpose and Need 1.4.2.5 - There is a need to close livestock grazing on three allotments and one pasture of another allotment. The Peninsula, Clevenger, and Goldmine/Falls Allotments, and on the Squaw Creek pasture of the Holms-Squaw Creek Allotment.	Close livestock grazing on all Grassland allotments totaling 102,938 acres of Grassland land, including the Peninsula, Clevenger, and Goldmine/Falls Allotments, and on the Squaw Creek pasture of the Holmes-Squaw Creek Allotment.	No allotments closed to grazing except livestock exclosures as presently fenced. 102,938 acres of Grassland open to livestock grazing through permit held by GBGA. The Peninsula, Clevenger, and Goldmine/Falls Allotments, and the Squaw Creek pasture of the Holms-	Close livestock grazing on the Peninsula, Clevenger and Goldmine/Falls allotments and the Squaw Creek pasture covering 8,233 acres of Grassland land.	Close livestock grazing on the Lower Desert (part of), Peninsula, Clevenger, and Goldmine/Falls allotments and the Squaw Creek pasture covering 13,261 acres of Grassland land.

Purpose and Needs	Alternative A No Action (No Grazing)	Alternative B Current Management	Alternative C Proposed Action	Alternative D
		Squaw Creek Allotment would remain open.		
Issue 1 - If not managed properly, livestock use can cause downward ecological trends and therefore loss of wildlife habitat. **Measurement standard** – Ecological Trend as measured using existing Condition & Trend Transects and Ecological-Site Write-ups.	Livestock grazing would have no impact on ecological trends as it is not included under this alternative. However, in the absence of juniper treatment and seeding the ecological trend is estimated to be downward long term as increasing juniper density results in the decrease of mid-sized shrubs and native perennial grasses.	Condition/trend analysis indicates that livestock grazing under current management would continue to result in static and upward trends on all but (possibly) the Peninsula Allotment. In the absence of juniper treatment and seeding the ecological trend is estimated to be downward as increasing juniper density results in the decrease of mid-sized shrubs and native perennial grasses.	This alternative prescribes more conservative grazing management than Alternative B as rest is added to ten allotments. Addition of a rest pasture creates an opportunity to increase organic matter on and in the soil which in turn will aid in the establishment and maintenance of deep-rooted perennial grass and forb species. This will aid in the advancement of succession (allowing for upward ecological trends).	This alternative prescribes more conservative grazing management than Alternative B as rest is added to eleven allotments. Addition of a rest pasture creates an opportunity to increase organic matter on and in the soil which in turn will aid in the establishment and maintenance of deep-rooted perennial grass and forb species. This will aid in the advancement of succession (allowing for upward ecological trends).
Issue 2 - Proposed soil-disturbing activities such as tillage, prescribed fire, mechanical juniper removal, and grazing have the potential to increase the amount and distribution of noxious weeds and invasive plants. **Measurement Standard** – Acres of treatment (grazing, tillage/seeding/fertilization, mechanical juniper control, prescribed fire, etc.). Acres of treatment located on clay soils (clay soils provide excellent habitat for medusahead, a noxious weed).	No vegetation treatments proposed, providing no risk of increased noxious weed establishment.	The following activities provide a risk of increased noxious weed infestation: Grazing on approximately 102,938 acres is proposed to continue.	The following activities provide a risk of increased noxious weed infestation: Grazing on approximately 82,923 acres. Juniper control, chainsaw–27,095 acres. Juniper control, chainsaw & prescribed fire-5,196 acres. Juniper/sage control, mechanical-488 acres. Sage/juniper control with fire-7,510 acres. Juniper control w/ till/seed/fertilization - 8,344 acres including re-seeding old tall grass seeding clay soils-Approximately 400 acres (Mud Springs Flat).	The following activities provide a risk of increased noxious weed infestation: Grazing on approximately 88,085 acres. Juniper control, chainsaw–10,803 acres. Juniper control, chainsaw & prescribed fire-5,196 acres. Juniper/sage control, mechanical-488 acres. Sage/juniper control with fire-4,757 acres. Juniper control w/ till/seed/fertilization - 8,344 acres including re-seeding old tall grass seeding clay soils-approximately 400 acres (Mud Springs Flat).
Issue 3 - Proposed management activities such as tillage, prescribed fire, juniper control, and grazing have the potential to affect water quality and quantity by changing upland and riparian vegetation cover and complexity. **Measurement Standard** – Acres of proposed treatment located in or adjacent to the Deschutes River, the Crooked River, the Metolius River, Squaw Creek, Mud Springs Creek, Lone Pine Flat, and Willow Creek; the major streams and rivers on the Grassland.	No treatments or grazing proposed.	Over ninety percent of grazing occurs outside of riparian areas, as they are fenced from grazing. Existing vegetation buffers would be expected to prevent soil or other material from entering the stream courses. No vegetation treatments proposed.	Over ninety percent of grazing occurs outside of riparian areas, as they are fenced from grazing. No vegetation treatments are proposed within areas fenced to exclude livestock. The following activities provide a potential to affect water quality and quantity: Deschutes River: Proposed juniper cut followed by prescribed fire on bench outside of canyon north of Lake Billy Chinook. 892 acres. Willow Creek: Proposed juniper cut/prescribed fire in Dump, McMeen, N. Willow, W. Willow, E. Alexander pastures and prescribed fire in Juniper Springs pasture all near Willow Creek (4,741 acres). Proposed seeding in Road and Windmill pastures across Highway 26 from Willow Creek (1,895 acres). Squaw Creek: Proposed juniper cut followed by prescribed fire proposed near Squaw Creek (549 acres). Mud Springs Creek: Proposed seeding	Over ninety percent of grazing occurs outside of riparian areas, as they are fenced from grazing. No vegetation management activities are proposed within areas fenced to exclude livestock. The following activities provide a potential to affect water quality and quantity: Willow Creek: Proposed juniper cut/prescribed fire in W. Willow pasture and prescribed fire in Juniper Springs pasture both near Willow Creek (72 acres). Proposed seeding in Road and Windmill pastures across Highway 26 from Willow Creek (125 acres). Squaw Creek: Proposed juniper cut followed by prescribed fire proposed near Squaw Creek (107 acres). Mud Springs Creek: Proposed seeding (204 acres).

Purpose and Needs	Alternative A No Action (No Grazing)	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			(204 acres).	
Issue 4 - Proposed management activities (grazing, tilling/seeding/fertilization, prescribed fire, and juniper control) may affect the quality, quantity, and distribution of wildlife habitat, specifically mule deer and antelope winter range. **Measurement Standard** –Acres of mule deer winter range treated. Acres of antelope winter range treated. Acres of juniper in the cover class M3 thinned.	Proposed activities are expected to affect the quality and quantity of the following amounts of listed habitats: No acres of mule deer winter range treated. No acres of antelope winter range treated. No acres of M3 cover class thinned. No grazing.	Proposed activities are expected to affect the quality and quantity of the following amounts of listed habitats: No acres of mule deer winter range treated. No acres of antelope winter range treated. No acres of M3 cover class thinned. 102,938 acres grazed per year.	Proposed activities are expected to affect the quality and quantity of the following amounts of listed habitats: 5,388 acres of mule deer winter range treated. 17,365 acres of antelope winter range treated. 7,217 acres of M3 cover class thinned. 74,590 acres grazed per year.	Proposed activities are expected to affect the quality and quantity of the following amounts of listed habitats: 3,141 acres of mule deer winter range treated. 11,569 acres of antelope winter range treated. 4,507 acres of M3 cover class thinned. 79,752 acres grazed per year.
Issue 5 - Manipulation of western juniper on the Grassland can affect visual qualities, old growth, and habitat diversity values. **Measurement Standard** – Acres of juniper control by cover/seral class.	No juniper treatment will result in the continued conversion of the historic sagebrush steppe that existed on the Grassland to juniper woodland. This results in: No short term impacts to visual qualities, but long term the open panoramic nature of the Grassland will be altered. No direct impacts to old growth western juniper stands, but places them at long term increased risk from wildfire. No short term impacts to existing habitat, but a continued loss of historic habitats.	No juniper treatment will result in the continued conversion of the historic sagebrush steppe that existed on the Grassland to juniper woodland. This results in: No short term impacts to visual qualities, but long term the open panoramic nature of the Grassland will be altered. No direct impacts to old growth western juniper stands, but places them at long term increased risk from wildfire. No short term impacts to existing habitat, but a continued loss of historic habitats.	The following treatment of western juniper will contribute to the maintenance and recovery of historic plant communities in proportion to the acres treated: 28,448 acres of E1 thinned 12,432 acres of M2 thinned 7,217 acres of M3 thinned 537 acres of L4a thinned This results in: Short term impacts to visual qualities, but long-term retention of the historic panoramic nature of the Grassland. No direct impact to old growth western juniper stands, but indirectly places them at decreased risk from wildfire. Short-term recovery of historic habitats and distribution of habitats on the Grassland. Providing greater habitat diversity short and long term.	The following treatment of western juniper will contribute to the maintenance and recovery of historic plant communities in proportion to the acres treated: 19,280acres of E1s thinned 5,705 acres of M2 thinned 4,507acres of M3 thinned 96 acres of L4a thinned This results in: Short term impacts to visual qualities, but long-term retention of the historic panoramic nature of the Grassland. No direct impact to old growth western juniper stands, but indirectly places them at decreased risk from wildfire. Short-term recovery of historic habitats and distribution of habitats on the Grassland. Providing greater habitat diversity short and long term.
Issue 6 - Grazing domestic sheep in potential bighorn sheep habitat increases the risk of transmitting disease if bighorn sheep are re-introduced to their historic habitat on the Grassland. **Measurement Standard** – Presence and proximity of domestic sheep grazing to potential bighorn sheep transplant area.	No domestic sheep grazing would provide any increased risk of transmitting disease to potentially reintroduced bighorn sheep.	Sheep grazing would be allowed on the Canadian Bench Allotment which is within seven miles of potential bighorn sheep transplant area. This increases the risk of transmitting disease to bighorn sheep should they be reintroduced to their historic habitat on the Grassland.	Sheep grazing could be allowed on the Canadian Bench Allotment which is within seven miles of potential bighorn sheep transplant area. This increases the risk of transmitting disease to bighorn sheep should they be reintroduced to their historic habitat on the Grassland.	No domestic sheep grazing would provide any increased risk of transmitting disease to potentially reintroduced bighorn sheep.

Table 2-8 Summarizes the expected effects of each alternative resource.

Table 2-8 Summary of Expected Effects by Alternative by Resource

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
Wildlife	Refer to Table 2-9	Refer to Table 2-9	Refer to Table 2-9	Refer to Table 2-9
Soils	Juniper density would continue to increase; coupled with increased fine fuel build-up with no grazing would create an environment ready for more large severe fires. These fires would volatilize minerals decreasing overall productivity and exposing more bare soil. This effect would create higher risk for soil erosion from wind and rain. Other identified soils (in the homesteaded and seeded areas) would not be restored through tilling and seeding, therefore retarding restoration.	Juniper density would continue to increase creating an environment ready for large severe fires (less risk than Alternative A as livestock grazing would reduce fine fuel buildup). These fires would volatilize minerals decreasing overall productivity exposing bare soil. The effect would be to create higher risk for soil erosion from wind and rain. Other identified soils (in the homesteaded and seeded areas) would not be restored through tilling and seeding, therefore retarding restoration. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less than 1 percent of the Grassland).	Juniper density would decrease as the result of the proposed juniper cutting and prescribed burning. The effect would be to maintain and or increase the acreage of sagebrush steppe that in turn would provide higher percent of ground cover (as opposed to closed canopy juniper stands), which would provide adequate or better ground cover for the protection of soils. Other identified soils (in the homesteaded and seeded areas) would be restored through tilling and seeding, therefore aiding in the advancement of succession. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less than 1 % of the Grassland). This alternative would provide more organic matter available for soil building, as rest would be added to many of the allotment grazing rotation. Addition organic matter could aid in the establishment of deep-rooted native perennial grasses and the advancement of succession toward HRV.	Juniper density would decrease as the result of the proposed juniper cutting and prescribed burning. The effect would be to maintain and or increase the acreage of sagebrush steppe which in turn would provide higher percent of ground cover (as opposed to closed canopy juniper stands) which would provide adequate or better ground cover for the protection of soils. With regards to the effects of juniper density control provided with this alternative, they would be less than that of Alternative C as fewer acres would be treated. Other identified soils (in the homesteaded and seeded areas) would be restored through tilling and seeding, therefore aiding in the advancement of succession. Grazing effects would include short-term compaction from livestock, which would be restored by annual freeze thaw cycles. There would be compaction around water troughs and gathering areas (less that 1 percent of the Grassland). This alternative would provide more organic matter available for soil building because rest would be added to many of the allotment grazing rotation. Addition organic matter could aid in the establishment of deep-rooted native perennial grasses and the advancement of succession toward HRV.
Non-native Invasive Weed Species	The primary action under this alternative is to allow juniper to continue expanding across the Grassland landscape. On some sites (flat and southern exposures) percent bare soil would increase as juniper canopies close. Bare soil provides an environment suitable for the spread of invasive plants.	The primary actions under this alternative are to allow juniper to continue expanding across the Grassland landscape and allow livestock grazing. On some sites (flat and southern exposures) percent bare soil would increase as juniper canopies close. Bare soil provides an environment suitable for the spread of invasive plants.	The primary actions under this alternative are to allow livestock grazing, control juniper density using chainsaw cutting and prescribed fire and to till, seed and possibly fertilize approximately 4,000 acres. There is a risk to the establishment of invasive plant species on the 4,000 acres	The primary actions under this alternative are to allow livestock grazing, control juniper density using chainsaw cutting and prescribed fire and to till, seed and possibly fertilize approximately 4,000 acres. There is a risk to the establishment of invasive plant species on the 4,000 acres

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
	Large wildfires, more probable with this alternative create severe exposed soil, which also provide an excellent environment for establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	Selective livestock grazing may favor invasive plant species, as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	proposed to be tilled and seeded. Through the tilling process, bare soil is exposed for a time (until seeded and other species establish). Selective livestock grazing may favor invasive plant species as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.	proposed to be tilled and seeded. Through the tilling process, bare soil is exposed for a time (until seeded and other species establish). Selective livestock grazing may favor invasive plant species as they tend to be less palatable than native and introduced grasses. Livestock may serve as a vector for the spread of weeds. Areas denuded of vegetation near water troughs and gathering areas provide environments suitable for invasive plant species establishment. They also provide areas where livestock may eat the invasive plants and reduce their presence. Large wildfires could create severe exposed soil, which also provides an excellent environment for the establishment and spread of invasive plant species such as medusahead and cheatgrass among many others.
PETS Plants	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on PETS plant species.	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on PETS plant species.	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on PETS plant species.	There are no known proposed, endangered, or threatened plant species documented or suspected of occurring within the Grassland. No known habitat exists for these species. Therefore this alternative has no effect on PETS plant species.
Fire and Fuels	Without vegetation treatments proposed under Alternatives C and D and without livestock grazing that reduces fine fuel accumulation, the risk of severe large wildfires on the Grassland increases. These fires could be destructive not only to the Grassland but properties adjacent to the Grassland. Rates of fire spread would decrease over time as the shrubs and grasses decline as juniper increases. The risk of crown fires would remain or increase. The risk of long-range spotting would be high. Air quality would be affected and unmanageable with wildfires (versus	Without vegetation treatments proposed under Alternatives C and D, the risk of severe large wildfires on the Grassland increases but not as much as Alternative A as livestock would reduce the risk of spread of wildfire as they consume fine fuels needed for fire spread. These fires could be destructive not only to the Grassland but properties adjacent to the Grassland. Rates of fire spread would decrease over time as the shrubs and grasses decline as juniper increases. The risk of crown fires would remain or increase. The risk of long-range spotting would be high. Air quality would be affected and unmanageable with wildfires (versus	With proposed juniper density treatments and continued livestock grazing the risk of large fire spread is reduced significantly. Without the quantity of fine fuels produced without grazing, the risk of fire spread is reduced. Crown fires may exist in the patches of juniper left after treatment but would not be as continuous as under Alternatives A and B and therefore easier to control.	With proposed juniper density treatments and continued livestock grazing the risk of large fire spread is reduced significantly. Without the quantity of fine fuels produced without grazing, the risk of fire spread is reduced. Crown fires may exist in the patches of juniper left after treatment but would not be as continuous as under Alternatives A and B and therefore easier to control.

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
	prescribed fires).	prescribed fires).		
Heritage Resources	No effects to heritage resources except from other ongoing activities such as recreation (off-road vehicle use, camping etc.) and fuel treatment projects (not included in the FEIS) that may be near or on heritage sites.	No effects to heritage resources except from other ongoing activities such as recreation (off-road vehicle use, camping etc.) and fuel treatment projects (not included in the FEIS) that may be near or on heritage sites. Grazing effects to heritage resources would not be measurable.	Project design criteria prescribed within Alterative C protects known heritage sites. There is a low risk of disturbance to unknown sites. High-risk areas are avoided during project layout and during heritage surveys through consultation. Following consultation, project design would be altered to avoid known and high-risk sites.	Project design criteria prescribed within Alterative D protects known heritage sites. There is a low risk of disturbance to unknown sites. High-risk areas are avoided during project layout and during heritage surveys through consultation. Following consultation, project design would be altered to avoid known and high-risk sites.
Fisheries and Hydrology	Expansion of juniper may influence the erodability of soils by out competing grasses and shrubs for water and nutrients. If erosion increases, sediment transport to perennial streams could increase yet not likely to be measurable. Differences in sedimentation from roads and recreational use and removing livestock would be difficult to measure. No direct impact to aquatic species. The risk to aquatic species is low.	Perennial streams and springs are protected with fencing. Indirect effects of grazing on aquatic resources are low risk. Livestock are not grazing within riparian zones except in Windom and Springer pastures, and then only used occasionally to improve grass vigor and wildlife habitat. Effects to aquatic resources are low because of current stable and upward ecological trends on the uplands and fenced riparian zones. The ungrazed riparian zones on the Grassland provide sediment filtering. No direct impact to aquatic species. The risk to aquatic species is low.	Livestock are not grazing within riparian zones except occasionally in Windom and Springer riparian pastures (grazed to maintain grass vigor and improve wildlife habitat). This alternative would increase proposed vegetation treatments that have the general effect of increasing grass and shrub ground cover would increase filtering vegetation and could reduce sedimentation reaching perennial streams more than in Alternatives A and B. Tilling, seeding, and fertilizing as proposed would have no measurable effect direct or indirect effects on aquatic species as no sediment is expected from these sites. Any sediment generated from these projects would not be disguisable from sediment generated. Effects to aquatic species would be low.	The same vegetation treatments are proposed under Alternative D as were in C except that the treated acreage under D is generally less. All treatments in Alternative C and D would increase filtering vegetation and could reduce sedimentation from reaching perennial streams more than Alternatives A & B. Proposed vegetation treatments would increase that have the general effect of increasing grass and shrub ground cover would increase filtering vegetation and could reduce sedimentation reaching perennial streams. Baseline sedimentation from the uplands that enters streams may be reduced as a result of increased understory. For Alternative D, effects are similar to Alternative C. Effects to aquatic species would be low.
Forage Production	As juniper density increases, over time forage production would decline substantially (more than 50 percent). Following the removal of livestock grazing generally forage production would increase for a few years and then decline. With wildfire, forage production would also increase for a few years after the fire and then decline as the plants become stagnant.	Over time as juniper density increases, forage production would decline substantially (more than 50 percent). Livestock grazing would continue to effect fire spread as livestock consume fine fuels needed for fire spread. Therefore livestock would reduce the positive effects of fire for forage production.	Juniper density control would aid forage production, as grasses would continue occupy sites. Proposed tilling would have a positive effect on forage production, especially for the few pastures proposed for seeding, but overall these projects would not affect forage production for the Grassland more than five percent at the most. Annual growing conditions are far more significant for forage production. The application of rest to many of the allotment grazing plans will eventually increase forage production as the rest period will increase plant vigor in general.	Juniper density control would aid forage production, as grasses would continue occupy sites. Proposed tilling would have a positive effect on forage production, especially for the few pastures proposed for seeding, but overall these projects would not affect forage production for the Grassland more than five percent at the most. Annual growing conditions are far more significant for forage production. The application of rest to many of the allotment grazing plans will eventually increase forage production as the rest period will increase plant vigor in general.

RESOURCE	Alternative A No Action	Alternative B – Current Management	Alternative C Proposed Action	Alternative D
Geology and Minerals	This alternative would not likely have an effect to slope stability. There would be no treatments on or adjacent to dormant landslide terrain.	This alternative would not likely have an effect to slope stability. There would be no treatments on or adjacent to dormant landslide terrain.	This alternative would not likely have an effect to slope stability. There would be a slight potential for debris flow 5-10 years after juniper is cut or killed by fire. There is a low potential for debris flows to reach streams. This alternative would treat less than 200 acres of dormant landslide terrain. The likelihood of such an occurrence is small.	This alternative would not likely have an effect to slope stability. There would be a slight potential for debris flow 5-10 years after juniper is cut or killed by fire. There is a low potential for debris flows to reach streams. This alternative would treat less than 200 acres of dormant landslide terrain. The likelihood of such an occurrence is small.
Recreation	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. This alternative would not have a measurable effect on visual resources. Juniper expansion would continue under this alternative. In time vistas available now along trails could be eliminated. Juniper expansion would also increase the risk of severe high intensity wildfires, which have the possibility of destroying developed recreation facilities.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. This alternative would not have a measurable effect on visual resources. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than four percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. With this alternative there would be unsightly un-vegetated areas around livestock water troughs and corrals. Juniper expansion would continue under this alternative. In time vistas available now along trails could be eliminated. Juniper expansion would also increase the risk of severe high intensity wildfires that have the possibility of destroying developed recreation facilities.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. Proposed vegetation management activities such as chainsaw use, prescribed fire and mechanical treatments would provide short-term increases in noise and dust experienced by recreationists. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than four percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. Post fire effects include smoke (for a few days at the most), black trees, and denuded vegetation. These effects are short-term. Natural barriers to off road use provided by existing juniper could be lost as juniper density projects remove trees.	This alternative would not have any measurable effects on special management areas or wild and scenic corridors. Grazing is currently not permitted in those areas. Proposed vegetation management activities such as chainsaw use, prescribed fire and mechanical treatments would provide short-term increases in noise and dust experienced by recreationists. Livestock would continue to trail through dispersed recreation sites. Visitors would continue to be subject to odors associated with livestock. Livestock are only in any given pasture for 5 to 15 days per year. Therefore the conflict occurs less than 4 percent of the year. Livestock use of designated trails while they are in any given pasture could have effects to the trail. Widening of the trail with use could be expected. Post fire effects include smoke (for a few days at the most), black trees, and denuded vegetation. These effects are short-term. Natural barriers to off road use provided by existing juniper could be lost as juniper density projects remove trees.

Table 2-9 Summary of Expected Wildlife Effects by Alternative

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
		HABITAT SPECIALISTS		
American Goldfinch	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase, but not as much as in Alternatives A, B, or D.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase.
Belding's Ground Squirrel	As juniper density increases habitat for this species would decline significantly, long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased Long term.	As juniper density increases, habitat for this species would decline significantly, long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Bighorn Sheep **Proposed for reintroduction to the Grassland.**	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term. No risk of disease transmission between bighorn sheep and domestic sheep.	Possible increased risk of disease transmission between bighorn sheep and domestic sheep. Habitat quality is not expected to increase from present conditions.	Changes proposed in grazing would improve habitat quality for this species Possible increased risk of disease transmission between bighorn sheep and domestic sheep. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Changes proposed in grazing would improve habitat quality for this species. No risk of disease transmission between bighorn sheep and domestic sheep while the Canadian Bench Allotment remains vacant. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Brown Creeper	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as pine stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as pine stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
California Quail	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also provides increased quality of habitat through more conservative grazing.
Gray Squirrel	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This squirrel is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This squirrel is not affected by seeding or grazing. Actions that revert to earlier seral/structural stages would decrease habitat for this bird in the short term. Long term as pine stands regrow, habitat will increase.
Horned Lark	As juniper density increases, habitat for this species would decline significantly long term. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Without grazing, habitat quality increases short term. Risk of large wildfires would be increased long term.	As juniper density increases, habitat for this species would decline significantly long term. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative provides the greatest increase in habitat quantity for this species, short and long term from juniper and seeding treatments. It also	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			provides increased quality of habitat through more conservative grazing.	
Least Chipmunk	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Mountain Quail	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
				species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Pine Grosbeak	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
Pygmy Nuthatch	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.	This bird is not affected by seeding or grazing. Actions to set back succession would increase habitat for this bird in the short term, but not as much as in Alternatives A or B. Long term as stands regrow, habitat will increase again, but not as much as in Alternatives A or B.
PROPOSED, ENDANGERED, THREATENED, and SENSITIVE SPECIES				
Northern Bald Eagle (T)	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
American Peregrine Falcon (S) **Not currently present on the CRNG.**	No Effects	No Effects	No Effects	No Effects
Greater Sage Grouse (S) **Extirpated from CRNG in 1950s.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Tricolored Blackbird (S) **Not currently present on the CRNG.**	No Effects	No Effects	No Effects	No Effects
Gray Flycatcher (S)	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Grazing has a negligible effect on these birds. Long term risk of large wildfires is increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Grazing has a negligible effect on these birds. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase foraging habitat from unsuitable to suitable in five to fifteen years. Grazing has a negligible effect on these birds. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase foraging habitat from unsuitable to suitable in five to fifteen years. Grazing has a negligible effect on these birds.
Pygmy Rabbit (S) **Possibly one colony on CRNG**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Bufflehead (S)	No Effects	No Effects	No Effects	No Effects
Neotropical Migratory Birds (Focal Species)				
Bullock's Oriole	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Black-throated Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
				This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Brewer's Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Lark Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through grazing.	than in Alternative B.
Lewis' Woodpecker	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	There are no treatments planned in this bird's habitat. There would be no change in habitat.	There are no treatments planned in this bird's habitat. There would be no change in habitat.
Loggerhead Shrike	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality for adult birds increases. Open habitat for young birds would decrease. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Quality and quantity of habitat is not expected to change from what exists today.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Thinning closed canopy stands would also increase habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would provide a good mosaic for these birds. Adults would have areas with cover while young birds would have open areas for foraging. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, and a mosaic of habitats created through grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Thinning closed canopy stands would also increase habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would provide a good mosaic for these birds. Adults would have areas with cover while young birds would have open areas for foraging. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Red-naped Sapsucker	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Sage Sparrow	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
	planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Sage Thrasher	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
Sharp-tailed Grouse **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of sagebrush habitat for this species in the short-term, but could increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Yellow Warbler	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Yellow-breasted Chat	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
Willow Flycatcher	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.	Riparian related species No effects anticipated.
RAPTORS				
Burrowing Owl **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for	Juniper density control is essential to this early seral species. Prescribed burns would return increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would decrease habitat quality for

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through grazing.	this species. Increased grass heights would increase predation rates. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Ferruginous Hawk **Not currently present on the CRNG.**	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover for their prey species would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover for their prey species would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.
Flammulated Owl	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			much as in Alternatives A, B or D.	
Golden Eagle	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
Northern Goshawk	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
Prairie Falcon	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.	Juniper density control is essential to this early seral species. Prescribed burns and thinning would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. Hiding and nesting cover would increase. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
Western Screech Owl	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	Pine trees would continue to increase in size, which would be beneficial to this species short and long term.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase, but not as much as in Alternatives A, B or D.	This bird is not affected by seeding or grazing. Actions to set back succession would decrease habitat for this bird in the short term. Long term as stands regrow, habitat will increase.
BIG GAME				
Pronghorn	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	Juniper density control is essential to this early seral species. Prescribed burns would increase acres of habitat for this species. Seeding treatments proposed would increase habitat from unsuitable to suitable in five to fifteen years. Changes proposed in grazing would improve habitat quality for this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
Mule Deer	As juniper density increases long term, habitat for this species would decline significantly. Non-native seeded areas would convert to natives, but in a time frame longer than analyzed in this planning document. Short term without grazing, habitat quality increases. Long term, risk of large wildfires would be increased.	As juniper density increases long term, habitat for this species would decline significantly. With deferred grazing, non-native seeded areas would convert to natives, but in a time frame longer than all other alternatives. Habitat quality is not expected to increase from present conditions. Long-term risk of large wildfires is decreased.	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of bitterbrush habitat for this species in the short-term, but would increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable in thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for	Juniper density control through thinning is essential to this early seral species. Prescribed burns could decrease acres of bitterbrush habitat for this species in the short-term, but would increase it long-term. Seeding treatments proposed would increase habitat from unsuitable to suitable thirty-five to forty-five years. Changes proposed in grazing would improve habitat quality for

RESOURCE WILDLIFE	Alternative A No Action	Alternative B Current Management	Alternative C Proposed Action	Alternative D
			this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B. This alternative is the best for this species due to increased habitat quantity short and long term from juniper and seeding treatments, increased quality of habitat through decreased grazing.	this species. With rest-rotation grazing, non-native seeded areas would convert to natives, twenty percent sooner than in Alternative B.
MANAGEMENT INDICATOR SPECIES				
Pileated Woodpecker	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.	There is no habitat for this species. There would be no effect.
White-headed Woodpecker	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	These birds require large trees in open canopy conditions. Succession would continue and trees would get larger.	There are no treatments planned in this bird's habitat. There would be no change in habitat.	There are no treatments planned in this bird's habitat. There would be no change in habitat.
Northern Flicker	Pine and juniper trees would continue to increase in size, which would be beneficial to this species short term. Long term however, stands would grow into closed canopy conditions, decreasing habitat for this species.	Pine and juniper trees would continue to increase in size, which would be beneficial to this species short term. Long term however, stands would grow into closed canopy conditions, decreasing habitat for this species.	This bird is not affected by seeding or grazing. Juniper thinning treatments would create open stand conditions, which these birds prefer. This alternative creates the most habitat long and short term for these birds.	This bird is not affected by seeding or grazing. Juniper thinning treatments would create open stand conditions, which these birds prefer.

2.7 References Chapter 2

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CHAPTER 3 - Affected Environment and Environmental Consequences

3.0 Vegetative Conditions

3.0.1 Introduction

In order to adequately understand the following discussions associated with vegetative conditions it is important to understand that different sections (Historic Range of Variability (HRV), Western Juniper and Old Growth Forests, Ecological Trends: Condition & Trend Transects, and Ecological Trends: 2001 Range Ecological Site Condition & Trend Survey) utilize different conventions for describing vegetative states and conditions. While the conventions may be different, the terminology is often quite similar which can lead to confusion and faulty comparisons.

The following definitions will be helpful in distinguishing which convention is being used (note that within the Viable Ecosystem Management Guide convention later seral status presumes an absence of historic fire regimes):

3.0.1.1 HRV and Western Juniper and Old Growth Forests (Ochoco National Forest, Viable Ecosystem Management Guide)

3.0.1.1.1 Historic Conditions – Estimated historic distribution by seral/structural stage (for a given PAG).

3.0.1.1.2 Historic Range of Variability (HRV) - An estimation of the historic range of a given variable.

3.0.1.1.3 Plant Association Group (PAG) - Plant associations grouped based upon similar: disturbance regimes, successional responses to disturbance, and productivity. The majority of the Grassland is categorized within a western juniper PAG.

3.0.1.1.4 Seral/Structural Stage - A combination (matrix) of three seral stages (early, mid, and late, based upon species shade tolerance) and five tree size classes (grass/forb/shrub, <5.0" dbh, 5"-8.9" dbh, 9"-20.9"dbh, ≥21"dbh). Within the western juniper PAG, seral stage is based upon a climatic climax condition (later climax would be exclusion of a historic fire regime). Under the viable convention, as juniper trees grow larger within most western juniper PAGs on the Grassland, the stand is moving toward a later seral/structural stage.

3.0.1.2 Ecological Trends: Condition & Trend Transects (FSH 2090.11)

3.0.1.2.1 Potential Natural Community (PNC) - The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances such as drought, floods, wildfire, insects, and disease, are inherent in the development of potential natural communities which may include naturalized nonnative species. Under the Ecological Status convention, as juniper trees grow larger within most areas on the Grassland, the stand is moving away from the Potential Natural Community which, for most areas on the Grassland, would be a big sagebrush community (under a historic fire regime).

3.0.1.2.2 Ecological Status – Ratings based on the similarity of current vegetation to the potential natural community. Include the degree of similarity between existing soil conditions and soil conditions at potential as measured by the degree of achievement of desired soil quality

standards. Express this similarity on a relative scale ranging from 1-100, with adjective ratings assigned as low, moderate, or high similarity. Under the Ecological status convention, as juniper trees grow larger within most western juniper sites on the Grassland, the stand is moving lower on the relative similarity (to Potential Natural Community) scale.

3.0.1.2.3 Ecological Type (also plant association/plant community) - A category of land having a unique combination of potential natural community, soil, landscape features, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Lacking potential natural community vegetation, ecological types can be developed with a provisional potential natural community based upon the present plant community and abiotic environmental factors. Categories of ecological types include all sites that have this unique combination of components with the defined ranges of all properties.

3.0.1.3 Ecological Trends: 2001 Range Ecological Site Condition & Trend Survey (NRCS National Range and Pasture Handbook)

3.0.1.3.1 Historic Climax Plant Community (HCPC) - The plant community that was best adapted to the unique combination of factors associated with the ecological site. It was in a natural dynamic equilibrium with the historic biotic, abiotic, climatic factors on its ecological site in North America at the time of European immigration and settlement (this would be inclusive of a historic fire regime). Under the NRCS convention, as juniper trees grow larger within most areas on the Grassland, the stand is moving away from the Historic Climax Plant Community which, for most areas on the Grassland, would be a big sagebrush community (under a historic fire regime).

3.0.1.3.2 Ecological Trend - The direction of change on any existing ecological site relative to the historic climax (see historic climax plant community later in this section) of the ecological site. Trend is either moving *toward* the historic climax, *static* (change not detectable), or *moving away* from the historic climax. Using the NRCS protocol, eleven factors are observed and rated in order to determine trend. Of the eleven factors, five are "Plant Factors" and six are "Soil Factors". They are:

1) Vigor of desired key plants.
2) Presence of seedlings and young desired plants.
3) Presence of decadent plants.
4) Presence of plant residues and litter.
5) Presence of invading undesirable plants.
6) Surface erosion.
7) Crusting.
8) Plant species composition.
9) Percent of bare soil.
10) Presence of gullies and rills.
11) Overall soil degradation.

3.0.1.3.3 Health - Defined as the degree to which the integrity of the soil, the vegetation, the water, and the air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as maintenance of the structure and functional attributes characteristic of a particular locale, including normal variability. Seventeen attributes are evaluated. They are:

1) Presence of rills.
2) Water flow patterns.
3) Presence of pedestals caused by wind or water erosion.
4) Amount of bare ground.
5) Presence of gullies.
6) Evidence of wind erosion.

7) Presence of cryptobiotic crusts.
8) Condition of the soil surface.
9) Infiltration capacity and surface runoff.
10) Plant mortality.
11) Functional plant groups.
12) Litter distribution.
13) Litter amount.
14) Evidence of plant stress.
15) Biomass production.
16) Presence of invasive plants.
17) Recruitment or reproduction of desirable plant species.

3.0.1.3.4 Range Condition - The present status of vegetation of a range site in relation to the historic climax or natural potential plant community for the site. Range condition is expressed as a percentage of the historic climax plant community presently occurring on the range site and grouped into the following range condition classes in Table 3-1A.

Table 3-1A

Range condition class	Percentage of climax plant community present on the site
Excellent	76-100
Good	51-75
Fair	26-50
Poor	0-25

Under the NRCS convention, as juniper trees grow larger within most areas on the Grassland (areas that are not biological old growth juniper areas), the stand is moving toward a poorer range condition.

3.0.1.3.5 Range Ecological Site (ecological site) - A distinctive kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

3.0.1.3.6 Rangeland Health - The degree to which the integrity of the soil, vegetation, water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as maintenance of the structure and functional attributes characteristic of a particular locale, including normal variety.

3.0.1.3.7 Similarity Index - A rating of the percentage of vegetative species composition occurring on a site as compared to the historic climax plant community vegetative species composition for that site.

3.1 Historic Range of Variability (HRV)

3.1.1 Current Management Direction (LRMP, FSM, etc.)

There are no goals, objectives, desired future conditions, or standards and guidelines specifically for this resource in the LRMP.

3.1.2 Affected Environment

The Interior Columbia Basin Ecosystem Management Project (ICBEMP) Science Integration Team study completed in 1994 (which includes the Crooked River National Grassland), illustrates the following comparison between the historical and current structural/cover type changes in the

Columbia River Basin (CRB). Table 3-1 demonstrates the loss of shrub and grass dominated vegetation and the large-scale increase in juniper woodlands throughout the CRB during the past 100 years.

Table 3-1 Columbia Basin Structural Stage Changes

Structural Stage	Cover Type	Historical Acres	Current Acres	Percent Change
Woodland	Juniper Woodland	152,698	208,297	36%
	Juniper-Sagebrush	1,182,863	3,113,000	163%
Closed Herbland	Wheatgrass-Bunchgrass	6,941,672	2,366,986	-66%
	Fescue-bunchgrass	7,985,422	3,761,398	-53%
	Big Sagebrush	1,943,464	306,898	-84%
Open Herbland	Wheatgrass-Bunchgrass	2,741,374	681,730	-75%
	Fescue-bunchgrass	3,821,215	308,118	-92%

The Viable Ecosystems Management Guide (1994) (VEMG) outlines a methodology of stratifying plant communities into groups of similar productivity, species composition, disturbance regimes and successional movement. These groups are called plant association groups (PAG). VEMG further describes a seral/structural matrix for characterizing forest vegetation within each of several PAGs. This matrix is a departure from the classical linear plant succession model which describes five successional stages (very early, early, mid, late, very late). In the VEMG seral/structural matrix, there are only three seral stages based on species composition (early, mid, and late), but each of these stages is subdivided into five structure categories (grass/forb/shrub, seedling/sapling, pole, small trees, large trees) based on the predominant tree size within the stand under consideration. The matrix contains 15 cells, each of which is labeled with a combination of the successional stage (E, M, L) and size/structure class (1-5). These are further subdivided into two categories by canopy closure (a, b). Stand types in the "a" category have greater than 55 percent canopy closure, while stands in the "b" category have 55 percent or less canopy closure. The M3a cell, for example, would reflect a mid-seral stage, predominantly of pole-sized trees with greater than 55 percent canopy closure. Table 3-2 displays the complete generic seral/structural matrix.

Within each cell there can be a variety of conditions in terms of: tree species, stand structure (even- or uneven-aged), size, density, and clumpiness. The authors of VEMG felt that this combination of structure, species composition, and canopy closure would be more suitable than the traditional linear plant succession model for describing the complex array of variable combinations that can exist on the landscape. The seral/structural matrix is applied to each PAG for consideration and comparison of historic condition, existing condition, and desired condition.

For the Crooked River National Grassland (Grassland) the E1 (grass, forb, shrub) stage is split into grass dominated (E1g) and shrub dominated (E1s) stages. The climatic climax tree species is limited to one species within the Western Juniper Woodland (WJW) and Western Juniper Steppe (WJS) plant association groups. The seral/structural matrix for the two juniper Plant Association Groups (PAGs) is displayed in Table 3-3 below.

Table 3-2 Seral/Structural Matrix and Definitions

Structure Class	Species Composition		
	Early	Mid	Late
Grass, forb, shrub (trees may be present but not dominant)	E1	N/A	N/A
Seedling, sapling (less than 4.9 inches dbh)	E2	M2	L2
Pole (between 5 and 8.9 inches dbh), high density	E3a	M3a	L3a
Pole, low density	E3b	M3b	L3b
Small (between 9 and 20.9 inches dbh), high density	E4a	M4a	L4a

Small, low density	E4b	M4b	L4b
Medium/large (21 inches dbh and larger), high density	E5a	M5a	L5a
Medium/large, low density	E5b	M5b	L5b

Table 3-3 Seral/Structural Matrix and Definitions for Western Juniper PAGs

Structure Class	Species Composition		
	Early	Mid	Late
Grass, forb (trees may be present but not dominant)	E1g		
Shrub (trees may be present but not dominant)	E1s		
Seedling, sapling (less than 4.9 inches dbh)		M2	
Pole (between 5 and 8.9 inches dbh)		M3	
Small (between 9 and 20.9 inches dbh), high density			L4a
Small, low density			L4b
Medium/large (21 inches dbh and larger), high density			L5a
Medium/large, low density			L5b

3.1.2.1 Viable Ecosystems Analysis

Historic vegetative conditions for the Ochoco National Forest (ONF) and Grassland were determined for the 1820-1900 time period. Sources of information for describing these conditions included the Ochoco National Forest Establishment Report (Hogdson 1916), USDA publications circa 1900, land survey notes, and anecdotal information from various sources. The proportion of each plant association group that historically occurred in each of the above cell categories comprises the reference for seral/structural stage composition. These proportions are expressed as a range, which recognizes the dynamic nature of the system and changing percentages of different stages over time.

The Viable Ecosystems analysis assumes that the historic vegetative seral/structural stage distribution (within the given ranges) represented certain habitats and functions that provided resilience over time and provides a baseline to compare existing seral/structural stage distribution against. Another important assumption is that radical departures from the set of recent historic seral/structural stage distributions that this baseline represents will increase the risk of compromising the viability of some or many of the species adapted to these distributions.

Using the PAG as the basic analysis unit, VEMG describes the pathways of plant succession from bare ground to the late seral forest. The primary focus is on the development of the over story vegetation, but associated under story species are also listed for each PAG. The roles of disturbance factors (fire, insects, and disease) are also included in this discussion. These disturbance agents can have various effects on plant succession, sometimes accelerating the movement toward the climax condition, at other times setting the vegetation back to earlier seral stages (insects for example). The size, frequency, and intensity of these disturbances combine to create vegetative mosaics across the landscape.

Existing seral/structural stage distributions were derived from an analysis of satellite imagery and aerial photos. This imagery displays various aspects of ground vegetation; from which we derived species composition, size/structure, and canopy closure. The pertinent satellite imagery data was coded according to our matrix groupings of structure/species composition/canopy closure and was input into the Ochoco National Forest Geographic Information System (GIS). The consolidated GIS information was combined with plant association maps to display the current vegetative patterns on the landscape. In general, the aerial photos used were most accurate for mapping the mid and late seral stage vegetation, while the satellite imagery was most accurate for mapping the early seral stage vegetation. These two datasets were combined in order to achieve the most accurate spatial model possible.

A spreadsheet was developed to compare the existing seral/structural stage distributions with the reference seral/structural stage distributions prescribed in the VEMG. This spreadsheet compares the acres from each cell/category in the seral/structural composition matrix and indicates whether a particular seral/structural stage is currently over or under represented as compared to its historic range, in the watershed. When a disparity is found between existing and reference seral/structural stage distributions, some initial management goals will become clear. For example, if a watershed or allotment is found to be presently deficient in stands dominated by mid-sized shrubs in the early successional stages, but has an over abundance of mid-seral stands of juniper, these latter stands could be thinned or burned to accelerate their development toward the deficient condition. Other considerations (patterns, adjacency, special features, other activities) are brought into the decision making process as well, but the focus in the short term is to begin bringing the vegetative seral/structural stage distribution closer to its HRV.

It may require several decades to restore seral/structural stage distributions to within the historic range, especially where watersheds are far out of balance. Given the unpredictable character of nature, the differential responses of vegetation to treatment, and the knowledge that is sometimes incomplete, there will always be a need to make mid-course adjustments. Watersheds will need to be re-evaluated at periodic intervals to determine the changes that have occurred and to re-assess the existing seral/structural stage distributions that are expected to be very dynamic over time. The desired distribution may ultimately be a "moving target" that is sought but never achieved, serving mainly as a means of directing or focusing management activities. The reliance on monitoring and adaptive management will be critical in order to challenge our assumptions, knowledge base and to achieve responsible management of resources.

In every watershed on the Grassland, there is an excessive amount of M3 (mid seral, 5–9 inch diameter juniper) when compared to HRV (see Table 3-4 below). There is also a consistent deficiency of seral/structural stages L4b (late seral, 9–20 inch diameter) and L5b (late seral, >20 inch diameter). Most watersheds are deficient in the E1 grass seral/structural stage.

Table 3-4 Existing Seral Structural Stage Acreage, HRV and the Difference for CRNG

Cover Type	Existing Acreage		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
			LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
E1g	20,325	18%	16,008	14%	21,974	20%	18,773	17%	4,317	4%	1,552	-1%	1,552	1%
E1s	37,104	33%	38,591	35%	53,009	48%	45,275	41%	-1,487	-1%	-8,171	-14%	-8,171	-8%
M2	30,640	28%	0	0%	10,808	10%	5,342	5%	30,640	28%	25,298	18%	25,298	23%
M3	18,903	17%	5,508	5%	10,808	10%	8,064	7%	13,395	12%	10,839	7%	10,839	10%
L4a	593	1%	0	0%	0	0%	0	0%	593	1%	593	1%	593	1%
L4b	3,217	3%	16,524	15%	32,424	29%	24,193	22%	-13,307	-12%	-20,976	-26%	-20,976	-19%
L5a	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
L5b	0	0%	5,508	5%	12,970	12%	9,133	8%	-5,508	-5%	-9,133	-12%	-9,133	-8%
Total	110,782	100%	82,139	74%	141,994	128%	110,782	101%						

*Note – located in Appendix C is a table listing the above data by allotment.

3.1.2.2 Trends

Figure 3-1 below displays estimated seral/structural distribution trends assuming there are no disturbances.

With no disturbance, the M2, and L4b seral/structural stages will increase over time. This is consistent with our current seral/structural stage distributions of over abundance that reflect the effects of long term fire suppression. Without fire as a disturbance process, western juniper becomes established and occupies an increasing amount of the landscape.

Conversely, without disturbance, there is a decrease over time in the E1g and E1s seral/structural vegetation acreage as areas are occupied by juniper trees which then grow to larger size classes.

Figure 3-1 Viable Ecosystems Projections

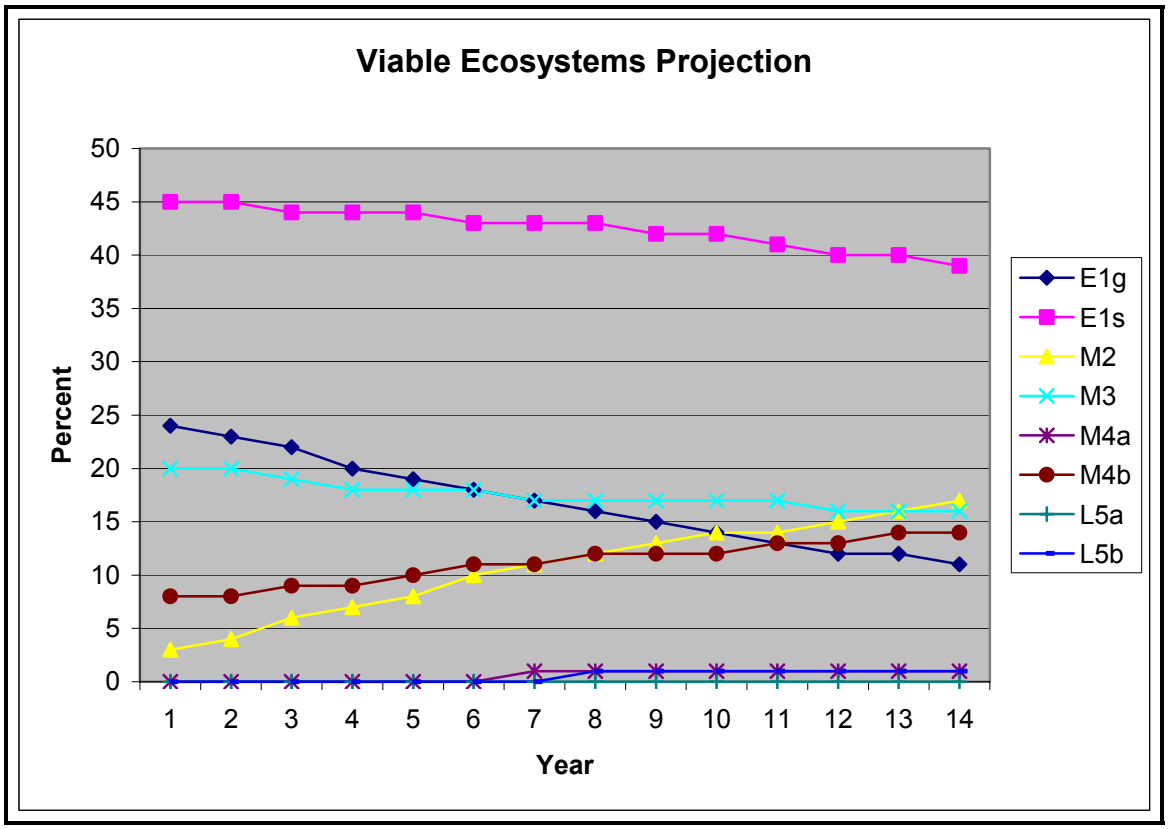
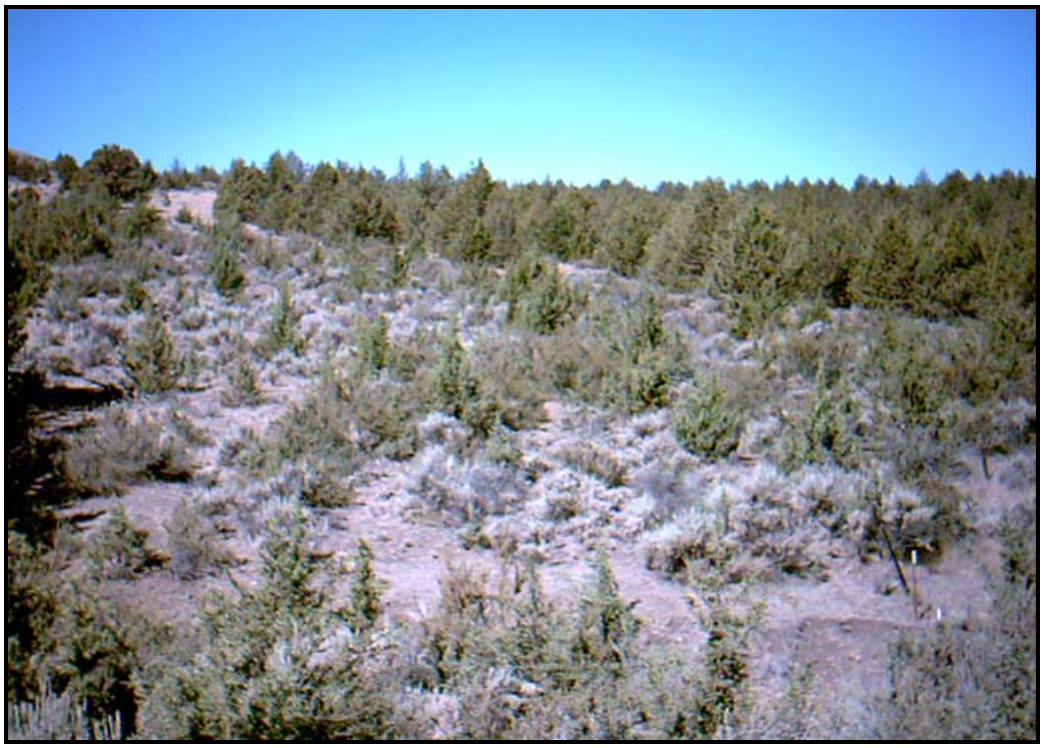


Figure 3-2 demonstrates the change from sagebrush steppe to juniper woodland that is taking place on the Grassland.

Figure 3-2 Photo Demonstrating Change from Sagebrush Steppe to Juniper Woodland, CRNG



No mesic ponderosa pine occurs on the Grassland. Xeric ponderosa pine (XPP) occurs but only in limited amounts (1,717 acres for the Grassland). This amounts to 1.5 percent of the total Grassland area. Most of the XPP PAG occurs within the Whychus and Lake Billy Chinook subwatersheds. Seral/structural stage distributions for the ponderosa pine PAG are similar to those for the western juniper PAGs. The E1 seral/structural stage (grass, forb, shrub) is either within or above HRV. Pole size ponderosa pine stages (structure stage 3) are generally above the HRV. There is a general deficiency of large size ponderosa pine (structure stage 5). Refer to Table 3-4 above for existing seral/structural stage acreage, HRV, and the difference between the two for the Grassland.

The proposed action vegetation treatment projects as described in Chapter 2 (Section 2.3) were arrived at after comparing existing seral/structural stage distributions to HRV distributions. Using the difference, the Interdisciplinary Team (IDT) selected vegetation treatment projects that would move the proportion of seral/structural stage acreage toward HRV. These project selections considered: past activities near and adjacent to the proposed projects, cultural and heritage areas needing protection, juniper old growth, wildlife habitat needs (antelope and deer winter range) and the LRMP Management Area standards and guidelines. Past activities considered included: wildfires, prescribed burns, juniper cuts, fuelwood areas, farmed sites, past seedings and subdivisions. Table 3-4 above displays existing seral/structural stage acreage, HRV, and the difference between the two for the Grassland.
Pre-settlement juniper (old growth) would be included in the L4b and L5b seral/structural stage acreage. Presently on the Grassland it is estimated that there is approximately 1000 acres of old growth. Old growth western juniper stands will be avoided during the vegetation treatments proposed under Alternatives C and D. In 2006, when the LRMP is revised, old growth designated areas and their management will be re-visited.

3.1.3 Environmental Effects

3.1.3.1 Direct and Indirect Effects

Under **Alternatives A and B**, the majority of the Grassland would convert from an array of juniper, sagebrush, and grass cover types to juniper woodland (in the absence of juniper density control).

Presently the Grassland is 52 percent (57,000 acres) grass and shrub seral/structural types (many of which also contain encroaching post-settlement juniper) which is above HRV. Without disturbance, this percentage would continue to decrease, long term. Juniper would dominate the landscape with occasional wildfires creating patches of grass and shrub types.

Wildfires on the Grassland could threaten adjacent communities, subdivisions, and other private property that surround and intermingle with Grassland managed lands. Under **Alternative A** (no grazing) there would be no reduction (associated with grazing) in the amount or distribution of fine fuels. Wildfires would likely have greater rates of spread and be: more intense, more difficult to control, and burn greater acreages. **Alternative B** would result in the greatest reduction (of the action alternatives) in the amount and distribution of fine fuels because of continued grazing. This activity would likely: reduce rates of fire spread, and in turn the size and severity of wildfires, make them easier to control, and result in fewer acres burned. As a result, the development of juniper woodlands would be expected to be faster with **Alternative B** than under **Alternative A** although the difference is expected to be very small.

Table 3-5 Alternative C - Existing Condition, HRV, Proposed Treatment, and Change by Seral/Structural Stage (Grassland administered lands within allotment)

COVER TYPE	EXISTING CONDITION		HISTORICAL RANGE VARIABILITY				PROPOSED VEGETATION TREATMENTS - ACRES					AFTER TREATMENT SUMMARY
	ACRES	%	LOW ACRES	LOW %	HIGH ACRES	HIGH %	SEED	RX FIRE	CHAIN-SAW CUT	CHAIN-SAW CUT RX FIRE	MECHANICAL	
E1g	20,325	18	16,008	14	21,974	20	102	0	0	1,289	0	1,391 acres of maintenance treatments, keeping E1g near HRV
E1s	37,104	33	38,591	35	53,009	48	8,154	4,788	15,063	1,160	112	29,277 acres of E1s treated. Keeping E1s near low HRV and moving E1g toward HRV.
M2	30,640	28	0	0	10,808	10	88	2,403	7,778	336	86	10,690 acres treated moving M2 to E1s and E1g. Net change E1g and E1s into HRV and moving M2 near upper range of HRV.
M3	18,903	17	5,508	5	10,808	10	0	319	3,717	2,411	290	6,738 acres treated, M3 to E1s and E1g. Net change M3 to HRV.
L4a	593	1	0	0	0	0	0	0	537	0	0	537 acres treated. L4a to L4b. Move L4 and L5 toward HRV
L4b	3,217	3	16,524	15	32,424	29	0	0	0	0	0	No treatment
L5a	0	0	0	0	0	0	0	0	0	0	0	No treatment
L5b	0	0	5,508	5	12,970	12	0	0	0	0	0	No treatment
TOTAL	110,782	100	82,139	74	131,429	129	8,344	7,510	27,095	5,196	488	

While grazing included within **Alternatives C and D** would reduce fine fuels to a lesser degree than **Alternative B**, but to a much greater degree than **Alternative A**, the effects of the vegetative treatments are expected to have a much greater effect on the rate and degree of juniper woodland

establishment and expansion than changes in grazing do. Tables 3-5 and 3-6 display **Alternatives C and D** vegetation treatment summaries and the changes the treatments proposed in those alternatives would make to existing cover type conditions. The tables display low and high figures for seral/structural stages as compared to HRV. This is because HRV is described in terms of ranges rather than given, absolute numbers. The acres of seral/structural stages are changing continually as natural disturbances occur (fire, wildlife, grazing, and weather conditions).

Table 3-5 (above) displays the proposed vegetation treatments under **Alternative C**. As noted in the table, seral/structural stages E1g, E1s, and especially M2 and M3 will move closer to HRV if the proposed activities occur. Therefore, **Alternative C** will move the existing conditions closer to HRV than either **Alternatives A or B.**

Table 3-6 (below) displays the proposed vegetation treatments under **Alternative D**. As noted in the table, seral/structural stages E1g, E1s and especially M2 and M3 will move closer to HRV if the proposed activities occur. Therefore, **Alternative D** will move the existing conditions closer to HRV than **Alternatives A or B**.

Because **Alternative C** proposes more treated acres than **Alternative D, Alternative C** would move the present seral/structural class distribution closer to HRV than **Alternatives A, B, or D**.

Table 3-6 Alternative D Existing Condition, HRV, Proposed Treatment, and Change by Seral/Structural Stages (CRNG administered lands within allotment)

COVER TYPE	EXISTING CONDITION		HISTORICAL RANGE VARIABILITY				SEED	RX FIRE	CHAIN-SAW CUT	CHAIN-SAW CUT RX FIRE	MECHANICAL	AFTER TREATMENT SUMMARY
	ACRES	%	LOW ACRES	LOW %	HIGH ACRES	HIGH %						
E1g	20,325	18	16,008	14	21,974	20	102	0	0	0	0	102 acres of maintenance treatments, keeping E1g near HRV
E1s	37,104	33	38,591	35	53,009	48	8,154	3,731	6,952	229	112	19,178 acres of E1s treated. Keeping E1s near low HRV and moving E1g toward HRV.
M2	30,640	28	0	0	10,808	10	88	1,026	2,428	2,077	86	5,705 acres treated moving M2 to E1s and E1g. Net change E1g and E1s into HRV and moving M2 closer to upper range of HRV.
M3	18,903	17	5,508	5	10,808	10	0	0	1,327	2,890	290	4,507 acres treated, M3 to E1s and E1g. Net change M3 closer to HRV.
L4a	593	1	0	0	0	0	0	0	96	0	0	96 acres treated moving L4a to L4b and closer to HRV
L4b	3,217	3	16,524	15	32,424	29	0	0	0	0	0	No treatment
L5a	0	0	0	0	0	0	0	0	0	0	0	No treatment
L5b	0	0	5,508	5	12,970	12	0	0	0	0	0	No treatment
TOTAL	110,782	100	82,139	74	131,429	129	8,344	4,757	10,803	5,196	488	

Table 3-7 below displays ten and 30-year cover type projections by alternative as previously discussed. This table allows a comparison of these projections to both existing and historic average acreages and percentages. Over the 30-year projection period, both Alternatives A and B display a dramatic decrease in E1 cover types, and a proportionate increase in M2, M3, and L4a cover types. Both of these projections would be away from the historic range of these cover types. On the other hand 30-year projections of Alternatives C and D display a much tighter correlation to HRV with Alternative C displaying the closest projection to the historic average.

Table 3-7 Cover Type Projections by Alternative

	Cover Type	Existing	Historic Average	Alt A +10	Alt A +30	Alt B +10	Alt B +30	Alt C +10	Alt C +30	Alt D +10	Alt D +30
Acerage	E1g	20,325	18,773	20,325	345	20,325	345	28,898	0	28,121	0
	E1s	37,104	45,275	37,104	38,532	37,104	38,532	38,768	61,940	34,171	52,318
	M2	30,640	5,342	30,519	18,552	30,397	18,552	21,550	5,418	26,255	8,963
	M3	18,903	8,064	18,843	15,320	18,661	15,320	17,757	12,851	18,424	13,181
	L4a	593	0	775	24,772	833	24,772	497	15,238	497	19,260
	L4b	3,217	24,193	3,217	0	2,507	0	3,313	5,682	3,313	6,053
	L5a	0	9,133	0	10,045	245	10,045	0	5,899	0	7,695
	L5b	0	0	0	3,217	710	3,217	0	3,754	0	3,313
		110,782	110,782	110,782	110,783	110,782	110,783	110,782	110,782	110,782	110,782
Percentage	E1g	18%	17%	18%	0%	18%	0%	26%	0%	25%	0%
	E1s	33%	41%	33%	35%	33%	35%	35%	56%	31%	47%
	M2	28%	5%	28%	17%	27%	17%	19%	5%	24%	8%
	M3	17%	7%	17%	14%	17%	14%	16%	12%	17%	12%
	L4a	1%	0%	1%	22%	1%	22%	0%	14%	0%	17%
	L4b	3%	22%	3%	0%	2%	0%	3%	5%	3%	5%
	L5a	0%	8%	0%	9%	0%	9%	0%	5%	0%	7%
	L5b	0%	0%	0%	3%	1%	3%	0%	3%	0%	3%

3.1.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

As displayed in Table 3-1, within the Columbia Basin the cumulative effect of fire suppression, agricultural development, urban expansion, grazing and other less disturbing activities have altered the present day mix of seral/structural stages as compared to the historic condition in the Columbia River Basin including the Grassland. Juniper dominated acreage has increased while there has been a reduction in the expanse and distribution of grass/herb and mid-sized shrubland dominated vegetation.

The following ongoing and foreseeable future projects/activities near or on the Grassland will have cumulative incremental affects on the present proportion of different seral/structural stages relative to the action alternatives:

The Grizzly Landscape Vegetation Project, located on the Grassland near Grizzly Mountain is designed to move existing conditions toward HRV through chainsaw cutting of juniper which has encroached onto sagebrush steppe sites. Approximately 3,000 acres of sagebrush steppe will be maintained through this project.

Suppression of wildfire on the Grassland will continue as urban interface zones surrounding the Grassland demand suppression for protection of homes and businesses. This suppression of wildfire will perpetuate the movement of seral/structural distribution away from HRV as juniper expands its presence and sagebrush steppe habitat is lost. Over the past 20 years this has resulted in the loss of approximately 2,500 acres of sagebrush steppe habitat per year.

Noxious weed control, as presently organized between the Grassland and Jefferson County will continue. This activity should contribute to move early seral sites toward HRV as weed dominated sites reverted back to native associations or are otherwise maintained in early seral status. In the

past, approximately 500 acres have been treated annually. This acreage could expand in the future after the Ochoco/Deschutes National Forests and Crooked River National Grassland Invasive Plant EIS is completed.

Planned and future fuel reduction projects for the Grassland will also contribute to the maintenance or movement of the Grassland toward HRV, as juniper is reduced in density and shrub canopies are manipulated through prescribed fire, chainsaw cutting or mowing. Treatments range from 0 to 2,000 acres annually. These acres may be similar to those proposed in alternatives C and D.

Fuelwood cutting by the public will aid in the movement of the Grassland toward HRV. The woodcutting areas on the Grassland are located in sagebrush steppe habitat that generally has less than 80-year-old juniper trees on-site. The cutting of these junipers will maintain sagebrush steppe plant associations. This activity occurs on, between 50 and 100 acres annually.

The Central Oregon Wildfire Schools (COWS) will continue to occur on the Grassland. This activity will also aid in the maintenance of HRV because the school uses practice fires for training purposes. These fires, which may reduce juniper density, are usually less than 50 acres each year.

In summary, the proposed vegetation treatment projects described in Alternatives C and D, in addition to the actions described above, will generally move seral/structural stages of existing vegetation closer to the range, distribution, and density of vegetation found historically in this area. Together, these activities will reduce the acreage of juniper woodland and increase the acreage of sagebrush steppe on the Grassland. In contrast, both Alternatives A and B will result in increasing divergence of vegetative characteristics from the historic range with increased acreage of juniper woodland over time and ultimately a true rarity of sagebrush steppe plant communities.

3.1.4 Forest Plan Consistency

There are no goals, objectives, desired future conditions, or standards and guidelines specifically for this resource in the LRMP.

3.2 Western Juniper and Old Growth Forests

3.2.1 Current Management Direction (LRMP, FSM, etc.)

Goals, objectives, desired future conditions and standards and guidelines from the Land and Resource Management Plan, Part 2 Crooked River National Grassland (LRMP 1989) provide management direction for the Grassland. Other than Standards and Guidelines for designated Juniper Old Growth stands, the LRMP provides little juniper management direction but it does provide Desired Condition direction as addressed under other functional area sections later in this chapter.

3.2.1.1 Goals and Objectives for Old Growth Juniper

- Provide stands of old growth juniper on the Grassland for wildlife habitat, ecosystem diversity, and aesthetic diversity.
- Manage the designated 15 old growth juniper stands spaced approximately five miles apart so that the unique habitat niches they provide will be available for the wildlife species that use them.

3.2.1.2 Desired Future Condition for Old Growth Juniper

- In ten years: "Designated old growth juniper sties will be providing habitat niches for diversity…"
- In fifty years and beyond: "Designated old growth juniper sties will be continuing to provide habitat niches and diversity

3.2.1.3 Standards and Guidelines for Juniper Old Growth (MA-G5):

- Use prescribed fire only to reduce fuel load if natural fuels accumulate to a level likely to result in a catastrophic fire (LRMP pg. 72).
- Permit only nonstructural improvements that are compatible with the primary objectives of the management area (LRMP pg. 77).
- Maintain existing improvements. Permit new improvements only when they are compatible with the primary objectives of the management area (LRMP pg. 79).

3.2.2 Affected Environment

As mentioned in the ICBEMP, juniper woodlands have been expanding in Central Oregon and the Columbia River Basin over the past 100 years (Miller and Wigand 1994, Miller and Rose 1995, Eddleman and Miller 1991, Miller, Eddleman and Miller 1992, ICBEMP 1997).

Western juniper woodlands occur across a broad variety of physiographic landforms, soil types, elevations, and moisture regimes. The area occupied by western juniper woodlands in the Pacific Northwest is nearly 4 million acres (Eddleman et. al. 1994). Over 2.3 million acres of juniper woodlands are in Oregon with approximately ten percent of the area in old woodlands (Eddleman et al. 1994). Nearly 90 percent of the area in Oregon is composed of young woodlands with trees less than 150 years old (Eddleman et al. 1994). Data and observation indicate the species continues to expand its range into new areas (Eddleman et al. 1994). Estimates provided from various sources including the Bureau of Land management, county Extension Offices, and NRCS Offices indicate that less than 4,000 acres per year of western juniper woodland in Oregon have been treated to reduce western juniper density over the last ten-year period. Wildfire is not included in these estimates. Conversely, age class-area data indicates a general rate of woodland expansion of about 18,000 acres per year in Oregon over the last three reported decades. However, expansion rates of stands roughly 30 years old or less were not reported (USDA/USDI 2000).

Juniper is a long-lived (400 to 700 years old (Miller, 1995b)) short to medium height tree present in almost all eastern Oregon counties. The center of its distribution and largest continuous expanse is in the central part of the state. Since the turn of the century, western juniper has been actively expanding its distribution and density in central and eastern Oregon. Its present distribution may be as much as double that which was present in the late 1800s (Eddleman 1986). In fact, regionally the abundance of western juniper pollen appears to be greater during this century than during the past 5000 years (Miller and Wigand 1994). Western juniper is very moisture competitive and an invasive species (Miller and Rose 1995). Western juniper has been expanding its range into adjacent shrub-steppe, grasslands, savannas, pine forests, and riparian/wetland areas during the past 100 to 150 years (Belsky 1996). Western juniper expansion has been attributed to livestock grazing which reduces the fine fuels required for effective fire spread, climatic changes (mild temperatures and above average precipitation in the late 1880s and early 1900s), and reduction in the fire frequency due to fire suppression and cessation of Native American burning (Eddleman, et al. 1994, Miller and Rose 1995, Miller 1995b).

As the previous section and the following photographs (Figures 3-1 through 3-5) indicate, in the absence of fire, the range and density of western juniper has increased dramatically across the Grassland.

Figure 3-1 - Gray Butte Early 1900s	**Figure 3-2 - Gray Butte 2004**
This early 1900s photograph illustrates the limited amount of western juniper trees occurring on Gray Butte.	This July 2004 photograph of the same area displays a tremendous increase of western juniper on Gray Butte. This increase is representative of what has occurred across the Grassland.

Figure 3-3 - Opal City Townsite 1911

The above 1911 photograph of the Opal City freight yard provides a backdrop of the western edge of Juniper Butte. The western mid-ground of this picture shows some trees while the majority of the remainder of the mid to background displays few trees.

Figure 3-4 - Opal City Townsite 2004

This July 2004 photograph from the historic location of Opal City displays a rather high density of western juniper trees on the same portion of Juniper Butte.

Although western juniper most commonly expands into and displaces mountain big sagebrush, aspen, and riparian community types, it is becoming apparent that western juniper is also increasing upslope within the dryer conifer types as well (Miller and Wigand 1994). Just as periodic fire is necessary to maintain big sagebrush, aspen, and arid riparian community types, a relatively frequent fire return interval is necessary to maintain ponderosa pine community types (ICBEMP, 1997). Although very little research has been conducted concerning the effects of juniper encroachment into ponderosa pine community types, with western junipers' efficiency in water usage (Miller, Eddleman and Miller 1992), influence on effective site moisture (Eddleman and Miller 1991), and ability to withstand stress (Miller, P.M. 1995), one would expect that western juniper could negatively impact ponderosa pine in a manner similar to other plants, especially if the pine is already stressed by drought, disease, and/or insect depredation.

The xeric ponderosa pine types on the Grassland provide an example of this kind of competition. Under much of the overstory pine the vast majority of tree regeneration is western juniper rather than ponderosa pine. Figure 3-5 provides an illustration.

Figure 3-5 Juniper Encroachment in a Ponderosa Pine Stand

Note that the majority of tree regeneration, under the ponderosa pine overstory, is western juniper.

3.2.2.1 Old Growth Juniper

There are two categories of old growth juniper represented on the Grassland: designated old growth and biological old growth.

Designated old growth juniper is a LRMP management area allocation (MA-G5). There are 15 designated old growth juniper management areas spread across the Grassland. Each management area is at least 40 acres in size and no more than five miles from another block. Each block may or may not contain biological old growth. Those that do not currently contain biological old growth were selected because the specific site contained the stands that could be managed to become old growth. All MA-G5 blocks are managed for old growth habitat conditions (LRMP p. 4-28). Refer to Map 16 - LRMP Management Area for the designated old growth locations.

Unlike many other tree species, the age of western juniper does not have sound correlation with diameter, or tree height; instead, "old growth" juniper is most soundly expressed by growth form. That is, while younger actively growing western juniper trees may have greater diameters or heights, their growth form may be described as "pointed topped". On the other hand, "old growth" juniper typically occurs on very rocky, harsh sites where their diameters and height are limited, but their growth form may be described as "flat topped" (Miller, R.M. 1995), or "spherical" (Agee 1993). Biological old-growth juniper has and does exist on the Grassland. Historically it primarily existed on ridge tops and in rocky areas (Eddleman et al. 1994). It is estimated that the Grassland has approximately 1,000 acres of biological juniper old growth (Adams 2004). The largest known stand is located in Sherwood Canyon.

Figure 3-6 - Old Growth Juniper

Biological old growth is characterized by the following:

- Trees have reached their maximum size.
- Height growth has slowed or ceased.
- Tree crowns are in various states of decline with sparse canopies, dead limbs, spike tops, and spreading, flattened tops.
- Tree boles are generally hollow.
- Bark is deeply furrowed, fibrous, and reddish in color.
- Branches are covered with fruticose lichens.

At least three independent studies have been conducted which contain information about the age of juniper trees on the Grassland. One study measured the age of trees in two undisturbed Research Natural Areas, one of which is located on the Grassland (the Island Research Natural Area). In the study area, more than 60 percent of the trees were established since 1978, and 81 percent were juvenile trees (Soulé and Knapp 2000). Another study measured trees in five matched pairs of study sites in central Oregon; one of the pairs was located on the Grassland in the Haystack Butte Research Natural Area. The Haystack Butte study site was divided into representative “undisturbed” and “disturbed” areas. The undisturbed site is located on steep, very rocky slopes with sparse cover and no evidence of widespread fire. This site is representative of where we expect older juniper to occur – on or near ridge tops-- and they do. The mean age of the sampled trees was 211 years old. In the disturbed area, which has much gentler slopes (and occurs downslope of the undisturbed site) the mean age of the sampled trees was 30 years (Soulé et al. 2004). In the third study, trees were sampled from two sites on the Grassland (Gray Butte/Pine Ridge and Round Butte). None of the trees in the plots classified as “old”. A few individuals were

established between 1850 and 1935, followed by a surge of establishment from 1945 to 1970 (Quinsey 1984).

3.2.3 Environmental Effects

3.2.3.1 Effects of Juniper Expansion

Figure 3-7 (following) illustrates the path succession takes from early seral/structural (E1 site dominated by grass and/or mid-sized shrubs) to late seral/structural (L5 site dominated by juniper) and how this pathway is affected by fire. This diagram demonstrates the critical role fire plays in the maintenance of sagebrush steppe plant cover types and/or the change to juniper woodland.

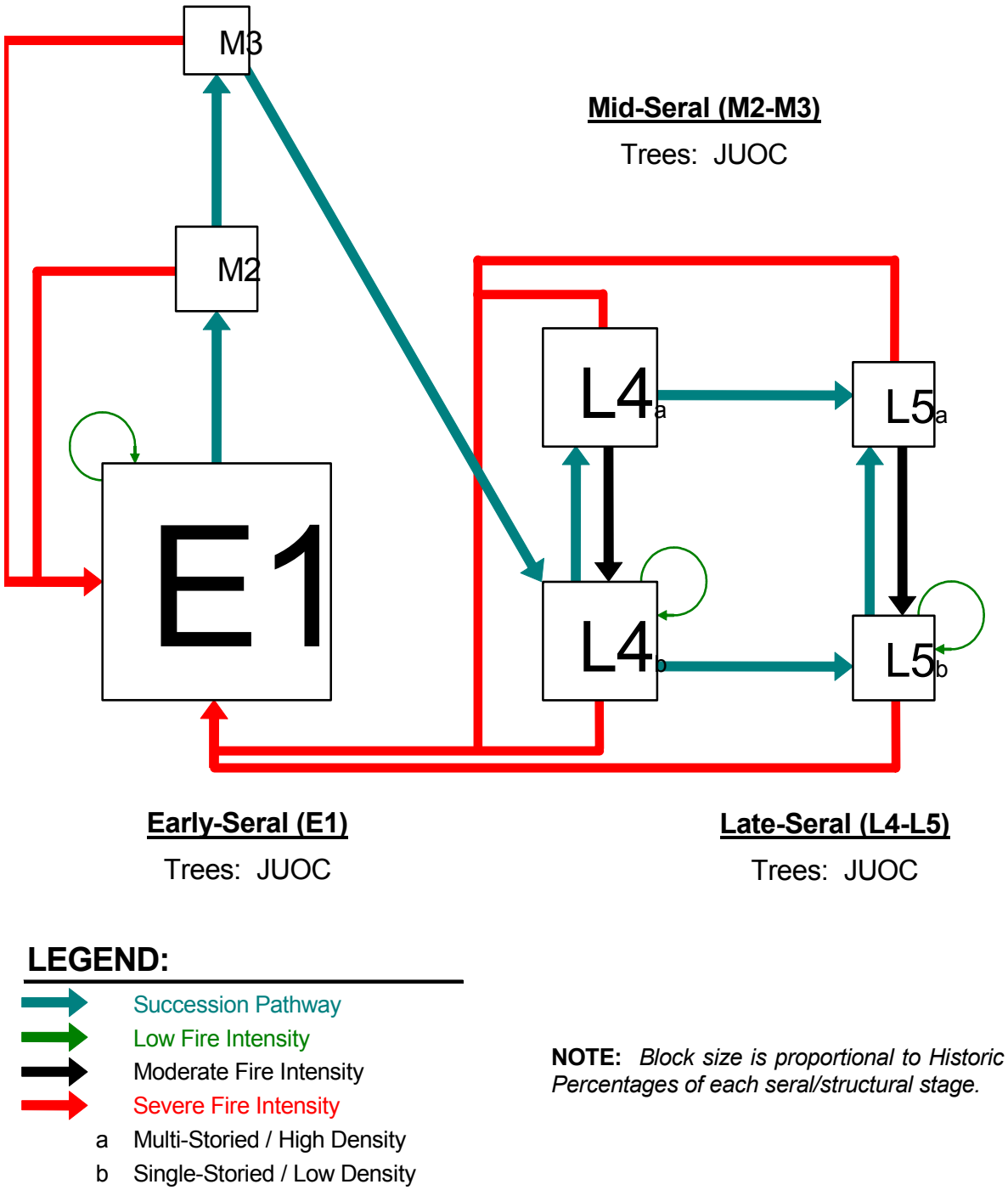
Juniper has an extensive lateral root system and a deep taproot allowing it to compete vigorously with other vegetation for available moisture. The amount of water used can be very high. It utilizes soil moisture much earlier in the spring than other plants in the same area (Bedell et al. 1993). In April, use may reach 20 gallons per day per tree (Bedell et al. 1993). With high soil moisture levels a single tree with a butt diameter of 18 inches may transpire up to 30-40 gallons per day (Bedell et al. 1993).

Buckhouse states, "*Western juniper encroachment into shrub-steppe communities can have a significant effect on the water cycle. Sites where juniper encroachment fosters biomass concentration on the tree with increasing amounts of bare ground in the interspaces become drier from decreased infiltration and precipitation into the soil profile and increased surface flows, which quickly carry water offsite. Sites also become drier with increasing juniper dominance because of interception and evaporation, gully erosion, and a lowering of the capillary fringe associated with influent ground-water systems…*"(Buckhouse 1999).

Western juniper is much more resistant to drought than most plant species, giving it a distinctive competitive advantage in the absence of fire (Meeuwig 1979).

Juniper is physiologically active much of the year when other vegetation is dormant. These active periods include very early spring, late summer to fall and even part of the winter in warmer basins. Juniper readily uses available nutrients and water before other species begin growth in the spring and during other periods of the year when other species are not growing (Bedell et al. 1993). As a result, on many sites the combination of water interception by juniper foliage and water use (transpiration) by juniper results in a decline in under story grasses, forbs, and shrubs between trees. Reductions in under story plant establishment and vigor are also experienced as juniper canopies close (Gedney et al. 1999). Reduced vegetative cover can also be expected to increase the number of days in which the soil surface is frozen. The presence of vegetation close to the soil surface decreases the freezing effect of cold air temperatures. In addition, it increases infiltration and percolation thereby decreasing the probability of overland water flow from small storm events and snow melt (Bedell et al. 1993). Vegetation is extremely valuable in absorbing incoming short wave radiation and re-emitting long wave radiation that slows or prevents the formation of frost at the ground surface allowing more potential infiltration into the soil.

Figure 3-7 Juniper Common Successional Pathways and Response to Fire



Juniper expansion also changes on-site organic matter relationships. Although total biomass production may not change, biomass distribution does. Biomass is sequestered in the tree in place of the organic matter that was previously located on or near the soil surface. This leaves the area between trees devoid of protection and vulnerable to the splash impact of raindrops. These areas are increasingly subject to the migration of soil fines to the surface resulting in hydrophobic "mud crusts" reducing infiltration into the soil profile and increasing surface runoff and the potential of

surface erosion. This increases the potential to lose the A and B soil horizons which represents the nutrient reservoir for the site (Goodman 2004, Miller and Wigand 1994). Long term dominance of western juniper on an invaded site also results in an alteration in energy and nutrient spatial distribution, with juniper concentrating "islands" of nutrient and biomass richness under and within individual tree canopies and rooting zones, amidst an "ocean" of nutrient and biomass deficient interspaces (Doescher, Eddleman and Vaitkus 1987) (Miller and Wigand 1994). This in turn is expected to drastically influence soil chemistry (Doescher, Eddleman and Vaitkus 1987). These influences profoundly affect the other plant species occurring on the site.

Rill and gully erosion is common on denuded sites between trees. This results in further decline in site productivity to the extent that existing ecological thresholds are now exceeded and ecological transitions to different, less productive new ecological states are created (Goodman 2004).

Precipitation falling on juniper is partially intercepted by the foliage, branches, and trunk. Most is evaporated back into the atmosphere and does not reach the ground. Interception loss in mature (80 – 100 yr old) woodlands is largely dependent on canopy cover. Research in south central Oregon suggests that a canopy cover of 20 percent results in a loss of effective moisture equivalent to approximately two inches per year and that of a 35 percent canopy cover represents an approximate three inch per year loss of effective moisture. Interception losses would be expected to increase where the proportion of precipitation received from storms of less than 0.5 inches also increases. If precipitation is largely wet snow without wind, intercepted amounts can be much higher (Bedell et al. 1993).

Removing juniper allows water to be redirected and utilized by other vegetation. In low precipitation zones other vegetation will utilize almost the entire amount of the released water (Buckhouse 1987 and 1999).

The availability of additional water could result in increased runoff. However, in areas where grass and shrub cover still persists, reduced juniper stocking would also increase the distribution and diversity of other vegetation, including grasses, forbs, and shrubs. This would result in better infiltration, less bare ground, less runoff, a greater diversity of vegetation and less soil erosion (Hydrology Report).

The effects of increasing western juniper density are well documented by research (Eddleman 1986 and Eddleman and Miller 1991), photos and Condition and Trend Transects. These effects include (see Appendix W for a more comprehensive discussion of western juniper ecology):

- Increasing depth to the water table and drier sites as the canopy closes.
- Mid-size shrubs such as sagebrush, rabbitbrush, and bitterbrush die-out as canopy closure increases.
- Cooler plant species replace warmer species directly under juniper canopies while more xeric (drier) species inhabit the interspaces (e.g., a bluebunch wheatgrass is replaced by Idaho fescue under juniper canopies and by Sandberg's bluegrass, or cheatgrass in the interspaces).
- Grass and forb production decreases.
- Conversion from a sagebrush-bunchgrass community to a western juniper-bunchgrass woodland.

Figure 3-8 (Tausch et al. 1981) displays the relationship between understory cover and juniper cover closure.

Figure 3-8 Effects of Juniper Canopy Closure on Understory Cover

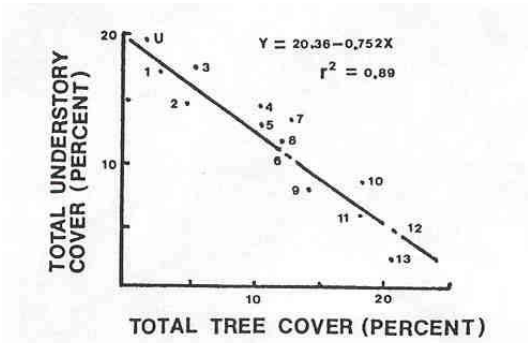


Figure 1.--Decline in understory cover as tree cover increases (Tausch and others 1981).

Others dispute some of the attributes assigned (by established research) to increased juniper densities and range. They state, that in spite of the conviction that junipers are degrading western rangelands and wildlife habitat, there is little or no experimental evidence suggesting that this is sure that juniper control will 1) increase water yield to springs and streams, 2) increase water infiltration, 3) reduce erosion, or 4) improve fish and wildlife habitat (Belsky 1996).

3.2.3.2 Direct and Indirect Effects

3.2.3.2.1 Juniper

Table 3-8 Alternatives A, B, C, and D Proposed Juniper Treatments, CRNG

	ALTERNATIVES			
JUNIPER DENSITY CONTROL TREATMENTS	**Alt A**	**Alt B**	**Alt C**	**Alt D**
Acres of Juniper Density Control - chainsaw	0	0	27,095	10,803
Acres of Juniper Density Control - chainsaw/prescribed fire	0	0	5,196	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire	0	0	7,510	4,757
Acres of Sagebrush/Juniper cover control - mechanical			488	488
Acres of Juniper Control as part of seeding treatments - chainsaw	0	0	8,344	8,344
Total Acres of Juniper Control	**0**	**0**	**48,633**	**29,589**

Alternatives A and B

These alternatives propose no juniper density control (Table 3-8). In both of these cases juniper would continue to expand its cover on the Grassland (see FEIS, Chapter 3, Section 3.1, HRV). Where only seedlings exist today among sagebrush steppe, in less than 20 years juniper will become the dominant plant as the mid-sized shrubs decrease in cover and eventually die-out. Grass and forb production and cover will decline as this trend continues. The only opportunity for cover type change from the eventual juniper woodland would be from wildfire. Wildfires are unpredictable in occurrence, size, and intensity by their nature (see FEIS, Chapter 3, Section 3.14). As discussed earlier, a greater cover and distribution of fine fuels would be expected under Alternative A due to stopping grazing. This in turn would be expected to result in greater rates of wildfire spread under this alternative, while grazing at current levels under Alternative B would be expected to reduce fine fuels to the degree that the rate of fire spread would be slightly to moderately decreased. Where fires burn intensely, succession will be set back to early seral/structural status (bare soil). In areas burned by wildfire there is an increased opportunity for invasive weed establishment.

Alternatives C and D

Alternative C (Table 3-8) proposes to treat approximately 49,000 acres of juniper while **Alternative D** proposes to treat approximately 29,500 acres. Both alternatives would retard conversion of sagebrush steppe community types to juniper woodland and, therefore, maintain more quickly disappearing sagebrush steppe habitat. Both would also move relative vegetative conditions, seral/structural status, and plant associations toward HRV. Most of the proposed juniper chainsaw treatments are located on sites that currently have a good component of mid-sized shrubs such as sagebrush and/or bitterbrush on them. On these project sites juniper is less than ten feet tall and scattered among sagebrush. The proposed treatments will: maintain the sagebrush steppe, be low cost, and have nearly no negative effects to soils or present vegetation. On some sites the proposal includes low intensity winter or spring prescribed burning seven or more years (less if necessary for fuels management or seeding objectives) after falling the juniper with chainsaws. Again, these sites generally have a mid-sized shrub component present today and only need removal of the encroaching juniper in order to maintain the plant association. Burning is prescribed to add age and size diversity to the existing shrub canopy. Occasional young junipers would be killed during the fire.

"*Removal of trees (juniper) allows that water to be redirected. In low precipitation zones, the water will be almost entirely consumed by other vegetation*." "*If juniper were removed at the lower precipitation zone (under 15 inches annual precipitation) and replaced with herbaceous vegetation, there is likely to be enhanced forage values and possibly a more uniform distribution of vegetation and, therefore, less bare ground and erosion hazard. It is unlikely, however, that creation of new seeps or springs would occur.*" (Buckhouse 1987)

3.2.3.2.1 Old Growth Juniper

None of the alternatives propose to treat the existing old growth juniper stand located in Sherwood Canyon. No vegetation treatment is proposed within the designated old growth areas (MA-G5). Wildfire would be the primary disturbance factor in these old growth stands. In the absence of wildfire (due to fire suppression) over the past 50 years some of the existing old growth stands are increasing in density as young juniper recruits are becoming prevalent in these stands. This condition presents an increased fire risk that could result in the loss of the entire stand as fuels between old growth stands increase.

Alternatives A and B

These alternatives do not propose any juniper or prescribed fire treatments. They do not propose any "maintenance treatments" within existing old-growth juniper either. Therefore, the chance of these stands being lost to wildfire increases as young juniper trees begin to occupy the spaces between the old growth that historically were probably maintained by ground fires and/or the presence of rock where fire could not spread.

Alternatives C and D

These alternatives prescribe some (less than 100 acres) thinning to existing mid-late juniper woodland stands (Units 6 and 16) with the desire to manage these stands for old growth qualities. The treatment would promote succession from mid and early seral/structural toward late seral/structural status (old growth). Project Design Criteria (FEIS, Chapter 2, Section 2.5) prescribe that during vegetation treatment project planning and layout any old growth juniper trees (pre-settlement) encountered would be avoided and, therefore, protected.

As mentioned earlier in the report, juniper old growth management on the Grassland will be addressed during the LRMP revision in 2006. The general intent at this time is to avoid losing existing old growth on the Grassland.

3.2.3.3 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Wildfire is the primary controlling factor affecting the range, density, and distribution of western juniper on the Grassland. Predicting wildfire occurrence, intensity, and spread is difficult. However, in the absence of treatment increased juniper range, distribution and densities will result in an increased risk of wildfire. The cumulative effect as a result of wildfire covers a wide range of possibilities from an intense summer wildfire that could kill all standing trees to local fire that has light fine fuels where the effect of the fire would be minimal as fire spread is limited.

Under Alternative A fine fuels would increase in the absence of livestock grazing. This condition would create fuel conditions that would encourage fire spread. **Alternative A** could provide an environment where large intense fires have a greater chance of occurring than under **Alternatives B, C, and D** where livestock grazing occurs. Under **Alternatives C and D**, the Westside of the Grassland would have minimal livestock grazing; therefore, under these alternatives, fire spread opportunities on the Westside would be similar to those described above under **Alternative A**.

Other ongoing and foreseeable activities, such as: the Grizzly Landscape Vegetation Project, future fuel management projects, firewood cutting by the public, The Central Oregon Wildfire School practice fires, and vegetation treatment projects planned on adjacent BLM and National Forest system lands, will have an overall effect of reducing acres of juniper invaded plant communities and aid in the maintenance of sagebrush steppe cover types. Over the next one to five years the BLM Upper Deschutes Resource Management Plan proposes to treat the following (see Table 3-9), depending on the chosen alternative.

Table 3-9 BLM Upper Deschutes Resource Management Plan Juniper Treatments by Alternative

	Acres of Shrub-steppe Juniper Cutting	Acres of Old-Growth Juniper Maintenance
Alternatives 2, 4 & 5	1,464	2,106
Alternatives 3, 6 & 7	4,074	2,196

In summary, wildfire will have mixed results on the Grassland depending on pre-fire fuel and burning conditions. The effect (relative to HRV) is therefore mixed and dependent on the factors mentioned above. Fuel management activities proposed on the Grassland in the future and those proposed by the BLM south of the Grassland will aid in the maintenance of sagebrush steppe cover types across the general area.

Table 3-10 Estimate of Total Proposed Juniper Acres Treated within BLM, Grassland, and Deschutes NF Lands

	Alternative A	Alternative B	Alternative C	Alternative D
Proposed in Grassland FEIS	0	0	48,633	29,588
Grassland fuel projects (estimated)	3,000	3,000	3,000	3,000
BLM	3,570-6,270	3,570-6,270	3,570-6,270	3,570-6,270
Sisters Ranger District	0	0	0	0
Total	6,570-9,270	6,570-9,270	55,203-57,903	36,158-38,858

Table 3-10 (above) displays the acreage of the existing juniper woodland in central Oregon that would be treated by alternative. These figures include proposed juniper treatments on BLM, Deschutes National Forest, and Grassland lands. Other juniper treatments will occur on private land in central Oregon. The amount of acres and location of juniper treatment on private land is

not known at this time. When these treatment acres are compared to juniper woodland acreage across central Oregon as a whole, less than five percent is proposed for treatment under Alternative C.

3.2.4 Forest Plan Consistency

Goals, objectives, desired future conditions and standards and guidelines from the Land and Resource Management Plan, Part 2 Crooked River National Grassland (LRMP 1989) provide management direction for the Grassland. Other than Standards and Guidelines for designated Juniper Old Growth stands, the LRMP provides little juniper management direction but it does provide Desired Condition direction as addressed under other functional area sections later in this chapter.

None of the action alternatives propose any treatments in designated juniper old growth areas (MA-G5).

3.3 Ecological Trends

3.3.1 Current Management Direction (LRMP, FSM, etc.)

There are no LRMP goals, objectives, desired future conditions, or standards and guidelines specifically for ecological trends.

3.3.2 Affected Environment

The existing condition discussion is separated into two parts:

- The ecological trends as generated from the Condition and Trend Cluster transect readings and the 2001 NRCS Rangeland Inventory.
- More specifically the spread, establishment, and system modifications associated with western juniper on the Grassland.

3.3.2.1 Condition & Trend Transects

Approximately 35 Condition and Trend Cluster transects (Parker 1951) were established during the 1950s and 1960s. Reading these transects provides an indication of ecological trend by; measuring changes in plant species composition over time, and by collecting soil surface condition information such as, the presence of bare soil, litter, rock or plant material. Most of these transects have been read approximately every 10 years since their establishment with the most recent reading occurring in 2001.

Figures 3-9 and 3-10 (below) illustrate typical changes that have occurred since these monitoring sites were established 40 - 50 years ago.

Figure 3-9 C20T2, Cyrus Allotment, 1958 **Figure 3-10 C20T2, Cyrus Allotment, 2001**

This change represents the successional progression from sagebrush steppe to juniper woodland which is occurring across the Grassland. Additional photo documentation can be found in the Range Specialist Report or at the Grassland office in Madras, Oregon.

Table 3-11 summarizes trends derived from the long-term transect monitoring data. Refer to Map 3 - Grazing Allotments, Designated Monitoring Area, C & T Cluster and Range Ecological Site Write-up Locations for the locations of these transects

Table 3-11 Current Condition and Trend Cluster Summary, CRNG

CLUSTER	LAND USE	SERAL CONDITION	ECOLOGICAL TREND	FORAGE TREND	SOIL SURFACE TREND
Boyce 6	Seeded	Early-Mid	Upward	Static	Upward
Boyce 7	Seeded	Early-Mid	Upward	Downward	Upward
Boyce 9	Seeded	Early-Mid	Upward	Static	Upward
Boyce 10	Seeded	Early-Mid	Upward	Downward	Upward
Cyrus 1	Native	Mid-Late	Static	Static	Downward
Cyrus 2	Native	Mid-Late	Static	Static	Downward
Cyrus 20	Native	Mid-Late	Static	Static	Downward
Cyrus 22	Native	Late	Upward	Static	Static
Fox 1	Seeded	Early-Mid	Upward	Downward	Upward
Grizzly 3	Seeded	Early-Mid	Upward	Downward	Static
Grizzly 14	Seeded	Early-Mid	Upward	Downward	Downward
Grizzly 16	Seeded	Early-Mid	Upward	Static	Upward
Grizzly 17	Seeded	Early-Mid	Upward	Downward	Upward
Grizzly 21	Native	Mid	Upward	Static	Upward
Juniper Butte 23	Seeded	Early-Mid	Upward	Static	Upward
Lone Pine McCoin 2	Native	Mid	Static	Static	Static
Lone Pine 2	Native	Mid	Upward	Upward	Downward
Lone Pine 12	Seeded	Early-Mid	Static	Downward	Upward
Lone Pine 13	Seeded	Low	Upward	Downward	Upward
Lone Pine 18	Native	Mid	Upward	Upward	Upward
Lone Pine 19	Native	Mid	Upward	Upward	Static
North 2	Native	Mid-Late	Upward	Upward	Upward
Peninsula 1	Seeded	Low	Downward	Downward	Static
Peninsula 2	Seeded	Low	Downward	Static	Static
Peninsula 3	Native	Mid	Upward	Static	Upward
Peninsula 4	Seeded	Early-Mid	Upward	Static	Static
Peninsula 5	Seeded	Low	Downward	Downward	Static
Rush 2	Seeded	Early-Mid	Upward	Downward	Upward
Rush 15	Seeded	Early-Mid	Upward	Downward	Upward
Rush 24	Seeded	Early-Mid	Upward	Downward	Upward
Steer 5	Seeded	Early-Mid	Upward	Static	Upward

NOTE

"Land Use" refers to whether or not the site was farmed during the homesteading era.
"Seeded," indicates the site was farmed during the homesteading era and then seeded by the Soil Conservation Service (SCS) or Forest Service.
"Native" indicates that to our knowledge the site was never farmed and remains dominated by native plant species.

Regarding Ecological Trend
"Upward" indicates succession toward historic climax plant communities,
"Downward" indicates succession away from historic climax plant communities,
"Static" indicates that the site does not demonstrate successional movement.

Regarding Forage Trend
"Upward" indicates increasing palatable forage species cover.
"Downward" indicates decreasing palatable forage species cover.
"Static" indicates no apparent change in palatable forage species cover.

The trends listed under Soil Surface refer to the percent ground cover occupied by plants and litter versus bare soil and erosion pavement.

Seral Condition

Today, most of the seeded sites are in early to mid seral stages of succession as represented by the number of native perennial plants present.

Juniper expansion is a concern on many of the native sites, particularly on sites historically dominated by sagebrush. Condition and Trend transect data (Figures 3-9 and 3-10) show that as juniper increases, predictable plant composition, and production changes occur. These changes include:

- The loss of mid-sized shrubs such as sagebrush, bitterbrush, and rabbitbrush.
- Change in the percent composition of perennial grasses, trending toward shade tolerant species such as Idaho fescue over bluebunch wheatgrass.
- Diminishing populations of perennial forb species.
- General decline in herbaceous plant production.
- Increasing percent of bare soil.

3.3.2.1.1 Ecological Trend

Ecological trend is upward or static on most sites measured. This trend is demonstrated by the replacement of seeded or introduced grass species (crested wheatgrass) by native perennial species on the seeded sites and the persistence of native species on native sites (Table 3-11). The individual Condition and Trend transect data and photos that document these trends are located in the Grassland Office in Madras, Oregon. Downward trend was monitored on three transects located on the Peninsula Allotment between the Deschutes and Crooked Rivers. This allotment is located on a bench above the two rivers. It is assumed that this trend is the result of overuse by livestock over the past 20 years (Adams pers. comm. 2004). This allotment has been voluntarily rested by the grazing permittee for the past three years.

3.3.2.1.2 Forage Trend (range trend)

This is a measure of available palatable forage species in the plant composition. On seeded sites, the forage trend is static or downward. This trend is the result of less productive native perennial grasses such as Sandberg's bluegrass replacing crested wheatgrass, a seeded species. The forage trend is static on most of the native sites with deep-rooted native perennial species persisting over the past 40 plus years (Table 3-11).

3.3.2.1.3 Soil Surface Condition

The soil surface condition on most sites has been upward as demonstrated by increases in litter and decreases in the amount of bare ground (Table 3-11).

There is a downward trend in soil surface condition on the three Cyrus allotment clusters because of juniper encroachment. Juniper out-competes understory vegetation and eliminates it from the site, resulting in increased levels of exposed soil (Table 3-11).

3.3.2.2 2001 Range Ecological Site Condition & Trend Survey

3.3.2.2.1 Range Ecological Sites/Soil Series/Plant Associations

The Natural Resource Conservation Service (NRCS) completed a range ecological site Condition and Trend survey in 2001 using NRCS protocols (USDA 1997). Ecological sites were confirmed and mapped and pertinent vegetation data collected (USDA 1997). Soil Resource Inventory (SRI) maps were used as the base. Once the soil type was identified, related ecological sites were mapped and plant associations were identified. Map 2 - Ecological Site Inventory displays the ecological site mapping on the Grassland.

Each attribute is rated in one of five classes or categories. "Extreme" represents the most degraded condition (USDA 1997).

After identifying ecological sites and plant associations, the following data was collected through the inventory process: species composition by weight, shrub composition by cover percentage, and an assessment of range ecological trend and health. These data allowed the following information to be calculated (USDA 1997):

- Similarity index.
- Annual production (lbs/acre/year).
- Useable production.
- Livestock allocation of useable production.
- Balance of useable production.
- Acres in the polygon.
- Livestock stocking rates (acres/AUM).
- Carrying capacity by polygon.

Thirty-two different ecological sites were confirmed and mapped. One hundred forty-eight site-specific "Ecological Site Write-Ups" (plots) were completed.

The two primary land use types identified were Native and Seeded.

Native Sites

These are sites that were not farmed during the homesteading era and remain dominated by native plant species.

West of the Deschutes River, native sites include juniper-pine-shrub, juniper-shrub and shrub sites. These sites generally include the deep-rooted native perennial grasses (Idaho fescue, bluebunch wheatgrass, squirreltail, etc.) and shrubs (sagebrush and bitterbrush). The NRCS Range Ecological Site Inventory was completed at the ecological site level, whereas the cover/seral type work used for the proposed vegetation treatment actions were completed at the PAG level of mapping. Similarity Indices are generally above 50.

There are patches/areas of cheatgrass within the native sites. These patches are the result of past disturbances such as: road construction and maintenance, logging, homesteading, and historic sheep bedding grounds.

The ecological status is mid to late. Forage conditions are fair to good as measured by plant species available for grazing by livestock (Idaho fescue and bluebunch wheatgrass which are common on the Grassland are excellent forage for livestock). Where western juniper is not increasing ecological trends are generally static or moving toward the historic preferred community. Over the majority of the Grassland the historic preferred community is characterized by the dominance of deep-rooted native perennial grasses and forbs under a range of sagebrush canopy cover levels.

East of the Deschutes River, native sites occupy the steeper ground around Gray Butte, Pine Ridge, Cyrus Hills, Haystack Butte, and Juniper Butte. They include juniper-bunchgrass, sagebrush-bunchgrass, and sagebrush/bitterbrush-bunchgrass ecological sites. Most of these sites are in mid to late ecological seral status due to the presence and amount of deep-rooted native perennial grasses such as Idaho fescue and bluebunch wheatgrass. These native sites generally exhibit similarity indices above 50 on the eastside of the Grassland, while seeded sites vary between 27 and 45. A similarity index of 27 indicates the dominance of introduced species or weeds and/or movement from sagebrush steppe to juniper woodland.

The ecological trend is generally upward on these sites.

The primary controlling factor of ecological processes and function on these sites is the presence, expansion, and increase in density of western juniper.

Seeded Sites

These sites were farmed for up to 40 years between 1850 and 1930. During the period from 1935 through 1965, most of these same sites were seeded to either crested wheatgrass or Whitmar (beardless bluebunch wheatgrass) as a restoration measure.

The crested wheatgrass seedings have generally changed over the past 45 years from a monoculture of crested wheatgrass to a more complex plant association that includes: rabbitbrush (both gray and green), sagebrush (mountain big, basin big, Wyoming big, and low), bitterbrush, Sandberg's bluegrass, bulbous bluegrass, Thurber's needlegrass, crested wheatgrass, and a variety of forbs such as lupine and phlox. The percent of crested wheatgrass on these old seedings varies dramatically but has declined considerably on many.

Whitmar (beardless bluebunch wheatgrass) seedings have been more persistent than crested wheatgrass seedings. Whitmar has phenological advantages over crested wheatgrass because it is a cultivar of bluebunch wheatgrass, the native deep-rooted perennial that was historically on these sites. Therefore, Whitmar may be better adapted to Grassland conditions than crested wheatgrass, which originates in Siberia and Russia.

Generally, ecological trend on sites which were historically seeded is upward while the forage trend is downward as Sandberg's bluegrass (a less productive native shallow-rooted grass) replaces crested wheatgrass.

Western juniper has also increased on these sites. As was discussed previously, western juniper historically occupied fire-protected sites (approximately 20-30 percent of the Grassland per the Viable Ecosystem model). "Presettlement" juniper stands that exist today most commonly occupy shallow soils. These stands are open, usually with less than five trees per acre. Presettlement trees are also commonly located on rocky rims (Miller 1995b). Historically, low sagebrush sites also lacked sufficient ground fuel to carry a fire.

Fire suppression, farming, and grazing disrupted the fire cycle and fire regime that kept juniper within its historic range, density, and distribution. Juniper has expanded and is found on approximately 90 percent of the Grassland.

Table 3-12 displays the acreage of seeded sites on the Grassland by allotment (Map 2 - Ecological site Inventory, and Map 3 - Grazing Allotments, Designated Monitoring Area, C & T cluster and Range Ecological site Write-Up Locations). The majority of the historically seeded sites are displaying an upward ecological trend (that is, native deep-rooted perennial grasses and forbs are replacing crested wheatgrass). Native mid-sized shrubs, such as sagebrush and bitterbrush are returning. However, some sites have not progressed successionally.

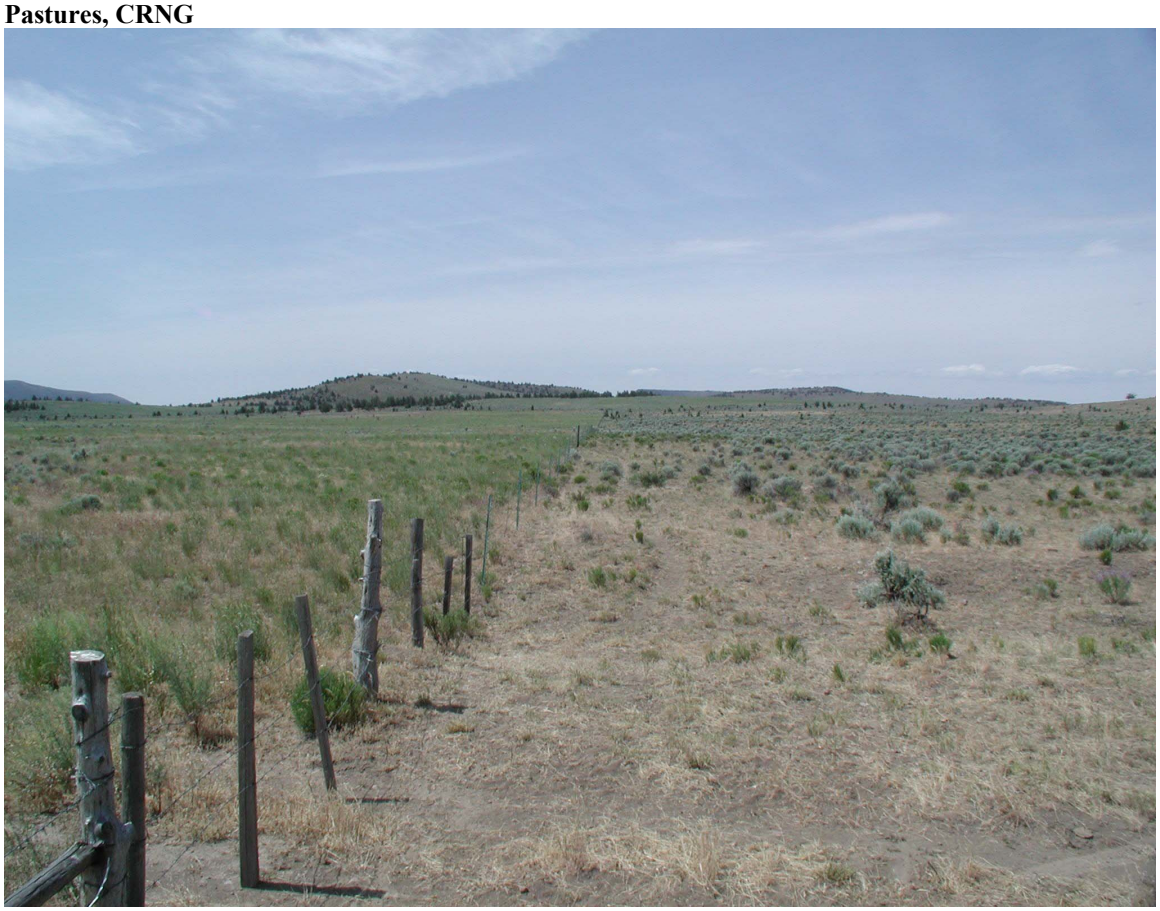
The allotments that have the most Sandberg's bluegrass dominated sites are the Steer, Boyce, and Rush allotments. These are the allotments that include proposed seedings under Alternatives C and D.

Table 3-12 Native and Seeded Acreages by Allotment (all ownerships)

Allotment	Native Acres	Seeded Acres	Total
Blanchard	1,262	6,500	7,762
Boyce	1,151	4,505	5,656
Canadian Bench	1,063	2,934	3,997
Clevenger	638	0	638
Cotter Pond	47	150	197
Cyrus	5,955	3,370	9,325
Devine	80	0	80
Fox/Dump	2,685	3,600	6,285
Goldmine/Falls	789	15	804
Gorge	268	914	1,182
Grizzly	1,956	7,223	9,179
Holmes-Squaw Creek	5,832	2,000	7,832
Juniper Butte	3,506	4,312	7,818
Kennedy	350	350	700
Lone Pine	6,072	3,150	9,222
Lower Desert	11,745	12,000	23,745
North	5,757	4,494	10,251
Peninsula	1,300	1,234	2,534
Round Butte	946	1,262	2,208
Rush	2,414	4,092	6,506
Steer	524	1,803	2,327
Weaning	0	238	238
Williams	1,252	25	1,277
Total	**55,592**	**64,171**	**119,763**

Figure 3-11 illustrates the difference between a site dominated by Sandberg's bluegrass (to the right of the fence) and one dominated by crested wheatgrass (historic seeded species) and other deep-rooted perennial species. Both sides of the fence represent historically farmed and seeded sites. The Sandberg's bluegrass in the photograph has cured and dried out and exhibits low palatability. The crested wheatgrass and other species in the photograph have not cured, are not dried out, and remain palatable to a variety of foraging species. The left side of the fence will remain palatable for at least three months longer than the right side. The potential for fall green-up (if moisture exists) is equal for both sides but the left side would produce significantly more available biomass than the Sandberg's bluegrass dominated side. The majority of these Sandberg's bluegrass sites are located in antelope winter range where palatability is a concern. Palatability is more important to pronghorn antelope than to cattle, especially during winter months when food can be scarce. This photo demonstrates the advantage of promoting succession on Sandberg's bluegrass dominated sites toward plant associations dominated by deep-rooted perennial grasses that have; more productivity, increased structural diversity and a longer window of palatability. Structural diversity as demonstrated on the left side of the photo provides habitat for ground nesting birds such horned lark, western meadowlark, and California quail.

Figure 3-11 Comparison of Forage Production Between Crested Wheatgrass and Sandberg's Bluegrass Pastures, CRNG



The following is quoted from a letter from Tamzen Stringham, Oregon State University Rangeland Resources Department (Stringham 2004) (Note Appendix B, for a copy of the letter). *"The consensus … was as Sandberg's became dominate the site's ability to retain soil declined (shallow mat-rooted, small stature plant) and 2 to 4 inches of soil has been lost through both water and wind erosion. The group recognized historic soil erosion prior to crested wheatgrass and after abandonment had occurred, however, the opinion was the domination of Sandberg's bluegrass has further facilitated soil erosion. The increase in Sandberg's bluegrass has set up a positive feedback loop that promotes the Sandberg's bluegrass community at the expense of deep-rooted perennials. In other words, Pose is controlling site processes. The decrease in the ability of the site to capture, store and safely release water to plants has effectively dried the site out. Sandberg's bluegrass is an early season grower that can utilize water in the near surface profile before the seedlings of Idaho fescue or bluebunch wheatgrass begin growth. In the event that the deep-rooted bunchgrass seedlings have the opportunity to begin growth the probability of survival beyond July, due to increased soil temperature and decreased soil moisture is quite low. The consensus of the group in regards to repair strategies was to focus on increasing soil water availability to plants both spatially and temporally through reduction in Pose domination and an increase in deep-rooted perennial plants.* "

The ICBEMP (USDA/USDI 2000) observed and reported "*Another dominant change within the dry grass PVG (Potential Vegetation Group) between historical and current was a decline within the upland herblands in the dominance of native bunchgrasses, such as bluebunch wheatgrass and Idaho fescue. With the decline in dominance of these native bunchgrasses came an increase in dominance of smaller-stature bunchgrasses such as Sandberg's bluegrass, an increase in exotic undesirable plants as already mentioned, and an increase in exotic seeded grasses (such as crested wheatgrass).*" This observation confirms conditions on some of these seeded lands on the Grassland.

Concentration Sites

There is a very small amount of area on the Grassland which would be considered to be perpetually heavy concentration areas for livestock impacts. These sites are primarily immediately adjacent to water troughs (Map 4 - Water Sources, Spring Developments, Guzzlers, Fences, and Exclosures). Impacts from livestock in these areas include both defoliation of vegetation and mechanical impacts to soils.

3.3.2.2.2 Range Similarity Index, Trend, and Health by Grazing Allotment

Table 3-13 displays the Range Ecological Trend and Health as documented by the 2001 NRCS Rangeland Inventory.

At the time of the NRCS survey, 40 percent of the trend indicators on the Grassland were moving toward Historic Climax Plant Community (HCPC) or potential; 52 percent were static or indicated no apparent trend; and eight percent indicated movement away from HCPC. HCPC is a vegetative description of a given site as it is estimated it would look like without disturbance by man. The ecological trend as a whole for the Grassland was and remains either static or moving toward HCPC.

The trend toward HCPC is not necessarily an indication of increased forage production. Many of the old farmed/seeded sites are declining in forage production while moving toward HCPC. This is due to the replacement of crested wheatgrass, (a productive forage species) with Sandberg's bluegrass (a less productive native forage species).

As the more productive native perennial grasses (bluebunch wheatgrass, Idaho fescue, squirrel tail, and needlegrass) return to seeded sites, forage production increases.

On the native sites, native deep-rooted perennial grass species have persisted. As western juniper encroaches into sagebrush steppe sites, grass species composition changes can occur. An example occurs on southern exposures that prior to juniper dominance were dominated by sagebrush and interstitial bluebunch wheatgrass. As the juniper canopy closes, a conversion takes place from sagebrush/bluebunch wheatgrass to juniper/Idaho fescue (with Idaho fescue only occurring directly under the tree canopies and the spaces between canopies being either bare ground or occupied by shallow rooted perennial or annual plant species). A more extreme condition can occur where the only grasses and forbs remaining after western juniper becomes dominant are shallow rooted perennial grasses (Sandberg's bluegrass) and annual forbs and grasses.

3.3.2.2.3 Summary of Condition & Trend Transect Monitoring and NRCS Inventory Results

Most trend indicators, as monitored by both protocols, indicated either trend toward potential natural community/HCPC or static trend. Three Condition and Trend Cluster transects out of 31, or 9 percent of the transects, indicated trend away from potential natural community. Eight percent of the 2001 NRCS Rangeland Inventory sites measured indicated movement away from potential natural community. Therefore, approximately 90 percent of the sites measured indicated stable or positive ecological trends. The two protocols, while maintaining different conventions appeared to produce compatible results.

Table 3-13 Range Ecological Trend and Health by Allotment (all ownerships)

			TREND (percent)			HEALTH (percent)				
Allotment	**Acres**	**Similarity Index**	**Toward**	**Static**	**Away**	**Extreme**	**Ext - Mod**	**Mod**	**Slight - Mod**	**None - Slight**
Blanchard	7,762	52	37	57	6	1	3	15	23	59
Boyce	5,656	37	45	49	5	2	5	10	30	54
Canadian Bench	3,997	31	45	52	3	0	6	13	58	24
Clevenger	638	36	42	36	22	2	11	21	27	39
Cotter Pond	197									
Cyrus	9,325	52	52	45	3	1	2	10	44	43
Devine	80									
Dump	471	42	45	55	0	0	2	2	45	52
Fox	5,814	31	41	50	9	1	5	9	26	59
Goldmine / Falls	804	66	34	52	14	3	13	26	41	17
Gorge	1,182	15	34	53	13	4	7	26	33	30
Grizzly	9,179	27	41	48	11	4	9	22	37	28
Holmes-Squaw Creek	7,832	42	43	46	11	1	1	14	31	54
Juniper Butte	7,818	40	36	59	5	1	8	24	43	14
Kennedy	700									
Lone Pine	9,222	43	46	44	10	1	4	16	33	46
Lower Desert	23,745	38	47	44	9	1	2	13	30	54
North	10,251	39	25	60	16	1	10	21	43	25
Round Butte	2,534	17	23	56	21	0	10	25	64	2
Peninsula	2,208	31	35	58	6	0	6	11	35	48
Rush	6,506	32	40	50	9	1	8	25	41	25
Steer	2,327	35	43	56	1	1	4	9	30	56
Weaning Pasture	238									
Williams	1,277	50	51	38	12	1	1	11	26	62
Grand Total	**119,763**	**37**	**850**	**1,063**	**186**	**26**	**117**	**326**	**774**	**853**
Percent			**40%**	**51%**	**9%**	**1%**	**6%**	**16%**	**37%**	**41%**

3.3.3 Environmental Effects

3.3.3.1 Direct and Indirect Effects for Native Sites

3.3.3.1.1 Alternatives A and B

Under these alternatives native plant sites would tend to remain as native plant sites (no seeding is proposed on these sites under any alternative), however, the continued increase in western juniper range, density, and distribution represents one of the greatest threats to the big sagebrush historic climax plant communities on the Grassland (the spread and establishment of noxious weeds

represents the other primary threat to these community types). As juniper cover type conversions occur, bare soil would increase allowing the opportunity for weed infestation and establishment. If this were to occur, the site would change from one that is native plant dominated to one dominated by invasive plant species such as medusahead.

Removal of livestock under **Alternative A** would be expected to halt and/or reverse downward ecological trends measured on the Peninsula Allotment Condition and Trend Cluster transects. Downward trends may continue under **Alternative B** due to continued grazing on this allotment.

Direction of trend would not change under either **Alternative A or B** where ecological trends are presently upward. However, the rate of successional change would be expected to be more rapid under **Alternative A than B,** in the short through mid term (0 - 20 years). In the absence of grazing those sites displaying a static trend would also be expected to show an upward trend in the short through mid term (0 - 20 years). In the long term, continued juniper expansion in shrub/grass sites would be expected to eventually revert NRCS ecological condition, forage condition, and soil stability index trends across the entire Grassland downward.

3.3.3.1.2 Alternative C

Forage reserves would be created on the Canadian Bench and Lower Desert Allotments (with the exception of the East Winter Pasture). They would be grazed occasionally as needed. The effect on ecological trend would be minor as both have been vacant from livestock grazing most of the past five years.

The institution of a rest rotation grazing system on some allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush) under this alternative is expected to result in a greater rate of upward trend on native sagebrush steppe sites than occurs under the deferred rotation grazing system (**Alternative B**), but at a lower rate than occurs under **Alternative A**.

3.3.3.1.3 Alternative D

Portions of the Lower Desert Allotment would be closed to grazing while the remainder would be an active allotment with grazing standards designed to meet mule deer winter range objectives. Ecological trend would be most affected by juniper and ponderosa pine canopy, and density changes. The Canadian Bench allotment would remain vacant with changes mainly resulting from the continued increase in the range, density, and distribution of western juniper on sagebrush/bunchgrass sites.

Ecological trends would remain stable or upward on the allotments proposed for closure to grazing (Clevenger, Goldmine/Falls and Squaw Creek Pasture) under **Alternative C**. Grazing would be terminated. In addition to those areas closed under **Alternative C**, the Peninsula Allotment and portions of the Lower Desert Allotments would also be closed under **Alternative D**. Downward ecological trends identified by some Condition and Trend Cluster transects on the Peninsula Allotment would probably be halted and ultimately reversed. These closures would involve approximately 8,845 acres under **Alternative C** and approximately 25,907 acres under **Alternative D**. On these closed allotments ecological trend would continue to be driven by juniper establishment and canopy closure. In time, sagebrush steppe sites would be expected to convert to juniper woodland sites. Such a cover type change would constitute movement away from HCPC.

The institution of a rest rotation grazing system on some allotments (Blanchard, Boyce, Cyrus, Fox/Dump, Grizzly, Lone Pine, Lower Desert, North, Round Butte, and Rush) under this alternative is expected to result in a greater rate of upward trend on native sagebrush steppe sites than occurs under the deferred rotation grazing system (**Alternative B**) but at a lower rate than occurs under **Alternative A**.

Effects to forage production are discussed later in this chapter in Forage Production/Livestock Use (Section 3.9.3).

3.3.3.2 Direct and Indirect Effects for Homesteaded/Seeded Sites

3.3.3.2.1 Alternatives A and B

Under these alternatives some of the seeded sites would continue to progress successionally toward native plant dominated plant communities. Without juniper invasion these sites would continue to move toward HCPC (when juniper dominates, native vegetation, shrubs, grasses, and forbs decline in distribution and cover).

3.3.3.2.2 Alternatives C and D

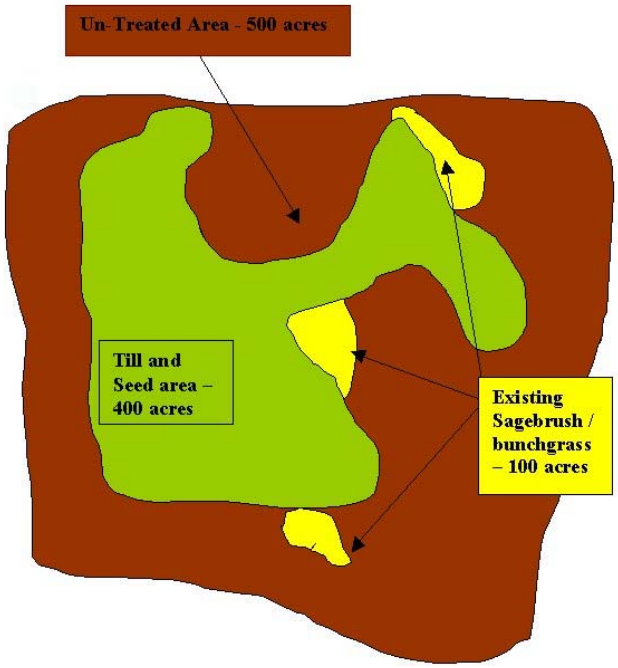
Both these alternatives propose tilling, seeding, and fertilizing 8,344 acres. Of this 8,344 acres, only approximately 4,100 acres (or 50 percent) of the "treated" acres would actually be tilled, seeded, and possibly fertilized under each alternative (refer to treatment Map 9 - Alternative C-Proposed Action and Map 10 - Alternative D). This treatment would decrease Sandberg's bluegrass dominance, increasing the presence and proportion of deep-rooted native grasses such as bluebunch wheatgrass, bottlebrush squirrel tail, and forbs such as alfalfa and lupine.

Alternatives C and D would reduce the percent composition of rabbitbrush. At the same time, islands of sagebrush/bunchgrass would be avoided to provide seed sources for sagebrush and other native species, and structural diversity for the sites.

The affect of the proposed seedings would be to promote upward ecological trend on these stagnated sites, moving species composition and cover towards its historic levels short through long term (5-30 years).

Figure 3-12 (below) displays an example of such a proposed seeding area. Note that not the entire area is tilled and seeded. Existing sagebrush/bunchgrass areas are left untreated as seed sources. The seeded area is irregular in nature adding diversity to the 1000-acre area.

Figure 3-12 Example of Seeded Treatment Pasture



The following table summarizes differences between ecological trend indicators by alternative.

Table 3-14 Ecological Trend Indicators – Estimated Change by Alternative

	Alternative A	Alternative B	Alternative C	Alternative D
NATIVE SITES **Estimated Change to Similarity Index and ecological trend**	In the absence of juniper encroachment, similarity index and ecological trend will be static or upward. With juniper encroachment, cover type change from sagebrush steppe to juniper woodland.	In the absence of juniper encroachment, similarity index and ecological trend will be static or upward, but less profound than alt A. With juniper encroachment, cover type change from sagebrush steppe to juniper woodland.	Similarity index and ecological trend static or upward due to proposed juniper treatment projects, and PDCs for grazing management.	Similarity index and ecological trend static or upward due to proposed juniper treatment projects, and PDCs for grazing management. Slower rate of change than Alt C. due to fewer acres treated.
SEEDED SITES **Estimated Change to Similarity Index and ecological trend**	Similarity indices and ecological trends upward as native plants return to these sites. Juniper encroachment would alter these rates of change to HCPC.	Similarity indices and ecological trends upward as native plants return to thee sites. Juniper encroachment would alter these rates of change to HCPC. Possibly slower rate of change than Alt A due to dampening effect grazing may have.	Similarity indices and ecological trends upward as native plants return to thee sites. Juniper encroachment would alter these rates of change to HCPC. Proposed seeding and juniper control treatments would increase the rate of upward trend. Grazing would have a possible	Continued upward movement in similarity indices and ecological trend as native plants return to thee sites. Juniper encroachment would alter these rates of change to HCPC. Proposed seeding and juniper control treatments increase the rate of upward trend. Grazing would have a

	Alternative A	Alternative B	Alternative C	Alternative D
			dampening effect on the rate of change.	possible dampening effect on the rate of change.

3.3.3.3 Direct and Indirect Effects for Concentration Sites

3.3.3.3.1 Alternative A

Under Alternative A adverse impacts associated with livestock use of water troughs would cease and it is expected that desirable perennial vegetation surrounding existing water troughs would reestablish slowly over the next five to ten years. However, if partners were found to maintain some or all of the water systems for wildlife it is possible that big game use of these water sources would be concentrated enough to prevent reestablishment of vegetation at some of these sites.

3.3.3.3.2 Alternatives B, C, and D

Under Alternatives B, C, and D adverse impacts associated with livestock use of water troughs would continue on active allotments (See Map 4 - Water Sources, Spring Developments, Guzzlers, Fences and Exclosures, Map 8 - Alternative B - Current Management, Map 9 - Alternative C- Proposed Action, and Map 10 - Alternative D) on an annual basis for as long as they remain active. The magnitude of this impact is estimated to be a total of 20 acres distributed across the entire Grassland.

3.3.3.4 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

3.3.3.4.1 Historic (prior to 1940)

Past activities that have profound influence on the existing ecological condition of the Grassland include: homesteading era dryland farming, historic grazing (prior to 1950), road construction, utility corridor construction, town sites, etc. Approximately 60,000 acres of historic farm ground, which today is seeded either to crested wheatgrass or Whitmar bluebunch wheatgrass, exists in various stages of succession primarily as a result of the intensity and duration of historic farming. Many of these sites were farmed for up to 40 years and then abandoned. Soil erosion took its toll after abandonment. Topsoil was lost to varying degrees. Compaction associated with historic farming persists on some of these sites today. Soil nutrients and organic matter were lost. Some historic seedings are advancing successionally more rapidly than others. Those sites that are moving forward more rapidly (i.e., Grizzly Mountain area) today have deep-rooted native perennial grasses and shrubs established on site. Other areas, such as the Boyce Corral area, are moving more slowly successionally. **Alternatives C and D** propose projects designed to rehabilitate areas severely impacted by activities of the past. Seedings are proposed where succession appears to be moving very slowly while the removal of young juniper is proposed to perpetuate sagebrush steppe cover types.

After 50 years of similar grazing management (stocking rate, deferred rotation, season of use) on all of the seeded sites by the Soil Conservation Service (SCS) and the Forest Service (FS), we still observe that the most profound difference between any given seeded site to be how intensely it was farmed 100 years ago.

3.3.3.4.2 Recent History (1940 – 2001)

Rehabilitation activities by the SCS and the FS since 1940 have included:

- Tilling and seeding 60,000 acres to crested wheatgrass and Whitmar bluebunch wheatgrass.

- Thousands of acres of chemical spraying to control mid-sized shrubs such as rabbitbrush and sagebrush.
- Thousands of acres of prescribed fire since 1975 to control juniper advancement.
- Hundreds of acres of juniper cutting with a chainsaw to control juniper density.
- Water and fence development and deferred rotation grazing.

During this period wildfire has been suppressed. The general ecological trends over this time period have been stable and/or upward depending on the site. SCS seedings stabilized the soil; grass production on the seeded sites helped add organic matter to the soils allowing for establishment of deep and shallow rooted native plants. Deferred grazing on suitable lands generally allowed for upward and/or stable ecological trends as measured by permanent Condition and Trend Cluster transects. During this time western juniper has increased its range, density and distribution on most acres of the Grassland, moving the cover types toward juniper woodland plant associations. Fire suppression and grazing have contributed to this condition as grazing reduces the volume of fine fuels needed for fire spread.

In summary, on most of the Grassland the effects of the past 50 years of management have been stable or upward ecological trends with or without grazing and significant increases in juniper density. Increased juniper density has caused a decline in the mid-sized shrubs (sagebrush, bitterbrush, and rabbitbrush) and declining grass and forb production (as measured on permanent Condition and Trend Cluster transects).

3.3.3.4.3 Ongoing and Foreseeable Future Actions

Alternatives A and B will include unplanned wildfires and fuel management projects and, to a lesser extent, move a portion of the Grassland to earlier seral conditions and toward a historic range of cover types. As a whole, the Grassland would probably not move appreciably toward HRV under these alternatives. The acreage burned by wildfire and the acreage of fuel management projects completed in the future would not be expected to keep pace with the rate of western juniper expansion on the Grassland.

Alternative C proposes to treat approximately 49,000 acres of juniper. When the Grizzly Landscape Vegetation Project and Skull Hollow Prescribed Burn acres are added to **Alternative C**, the total acres treated equals approximately 53,000 acres of juniper treated over the next 10 year period. Similarly, **Alternative D** would treat 33,500 acres of juniper over the next 10 years (including the Grizzly Landscape Vegetation Project and Skull Hollow Prescribed Burn acreage). In addition to these proposed projects, wildfires are expected to occur, as are additional fuel management projects, over the next ten years. The magnitude of these projects is unknown at this time. These two activities would move succession (where they are conducted) to earlier seral conditions (i.e., a wildfire in an E1s stand in the future would move the cover/seral stage to E1g.). In general, the proposed vegetation treatments in **Alternatives C and D**, coupled with future wildfire and possible fuel management projects, will maintain E1g and E1s sites and move existing M2, M3 and L4 cover types to earlier seral stages. The overall effect of these activities (planned and un-planned) is to move the magnitude and distribution of ecological cover types toward HRV.

These activities, for the most part, are continuing the trends described above under "Recent History". Grazing on the Grassland is more conservative today than it was five years ago. The present use of stubble height as a grazing utilization standard is providing more plant material on the ground at the end of the grazing season than past utilization standards (Adams 2004). This practice will contribute to the establishment of deep-rooted native perennial grasses and forbs on old seeded sites.

Ecological conditions on adjacent private lands vary greatly. On the Deschutes National Forest, to the west of the Grassland, ponderosa pine and mixed conifer forest occur over bitterbrush and bunchgrass understories. Most of these sites are in mid-seral cover types due to past logging activities and the effects of prescribed and wildfire. When considered with the open sagebrush steppe and juniper woodland of the Grassland, the two provide good habitat for many wildlife species along with many other wild-land qualities. Agricultural land (along with dispersed home sites) occurs to the south and is interspersed with Grassland public lands. These sites are generally in early stages of succession (farms and yards) mixed with old stands of juniper woodland on rocky ridges and scablands that were unsuitable as farmland. To the east of the Grassland is primarily ranch/forest land with fewer home sites. These areas are also generally in mid- seral cover types due to past logging and juniper control projects. The Grassland is a transition zone between the Cascades and the Ochoco Mountains. It provides diversity to ponderosa pine and mixed confer forests to both the east and the west.

The cumulative effects to seeded and native sites from recreational activities, while dramatic, usually are confined to small acreages. Camping, off road vehicle use, recreational special uses (dog trials and endurance rides), biking, and trail riding generally promote early seral cover types across relatively small acreages.

The Grassland has utility corridors (gas pipeline and four power lines) running the length of it. Utility companies keep these right-of–ways in early seral cover types, usually removing juniper. These activities remove juniper from sagebrush steppe sites in effect contribute to movement toward the historic vegetative composition of the Grassland on both seeded and native sites.

Cumulative effects on seeded sites (on altered sites) are variable depending on the degree of the disturbance during the homesteading period. As mentioned above, many of these sites are proceeding successionally toward HCPC while others are not. Cumulative disturbances on these sites include: wildfire (or the lack thereof), grazing, off-road use, firewood cutting, and past juniper control projects (prescribed burns and chainsaw cutting).

If a farmed/seeded site has a residual "A" soil horizon and any past soil compaction has been ameliorated, it is probably moving toward a historic plant community type (juniper invasion is a primary threat to this trend). An excellent example is the base of the Grizzly Mountain located on the Grizzly Allotment. While this was a historically farmed site that was seeded to crested wheatgrass, it generally is moving toward potential. The Grizzly and the Rush Allotments have had similar grazing practices applied since 1950; stocking rates have also been similar but they exhibit different rates of change toward historic plant associations today as a result of the difference in the intensity of the disturbance each received during the homesteading era.

3.3.4 Forest Plan Consistency

There are no LRMP goals, objectives, desired future conditions, or standards and guidelines specifically for ecological trends.

3.4 Geology

3.4.1 Current Management Direction (LRMP, FSM, etc.)

There are no goals, objectives, desired future conditions, or standards and guidelines for geology relative to the actions proposed in this FEIS.

3.4.2 Affected Environment

The Crooked River National Grassland (Grassland), 111,571 acres, is located within the following watersheds totaling 424,463 acres: Deschutes South (37,880 acres), Lake Billy Chinook (61,582 acres), Crooked River Grasslands (55,942 acres), Lower Crooked River Valley (61,911 acres), Lower Metolius (21,629 acres), Mud Springs Creek (58,943 acres), Willow Creek (82,653 acres) Steelhead (23,405 acres), and Whychus (20,518 acres) watersheds. They are all located in the vicinity of the confluence of the Deschutes and Crooked Rivers on the Crooked River National Grassland.

The Grassland is underlain mainly by a mixture of rhyolite, basalt, andesite, and sedimentary rocks. High plateaus and dissected ridges with moderately steep sideslopes are the predominant landform. Mass wasting played a role in the shaping of the landscape by creating large areas of hummocky terrain, seeps, ponds, and springs. Present day erosion processes are primarily channel, sheet and rill, minor mass wasting in the form of landslides, debris flows, rock topple, and slope creep. The watersheds are a recharge collection area for regional and local aquifers, parts of which discharge into the Deschutes and Crooked Rivers. A cap of 6,900-year-old Mazama ash is mixed in the soil mantle.

3.4.2.1 Landform

The Grassland analysis area is within the Columbia Basin ecological region (Gordon 2004, Appendix A). Grassland public lands within the watersheds are composed of the juniper shrub steppe eco-region, major Land Resource Area B10 and B8 on largely basalt and rhyolite bedrock.

The development of the scenic cliffs and spires on the Grassland are due to natural erosion processes. The related tectonic fault traces, visible on aerial photographs, have influenced the development of drainage patterns.

The mass wasting process includes the formation of talus slopes, deep-seated landslides, slope creep, rock topple, debris flows, and earthflows. The slip surfaces for deep-seated dormant landslides tend to be located within the underlying bedrock. The slip surfaces within debris flows and earthflows tend to be within the soil zone or very shallow bedrock. The wet areas adjacent to dormant landslides and tectonic faults identify interrupted drainage flow. These springs and seeps can be more sensitive to destabilization (mass wasting) when vegetation is removed. They are also cold water sources for nearby streams.

Based on an air photo interpretation, the Grassland area has a series of dormant landslide scarps and debris lobes across six of the nine watersheds (Mud Springs Creek, Willow Creek, Deschutes South, Crooked River Grasslands, Lower Crooked River Valley, and Whychus).

Dormant landslide terrain underlies 1,127 acres (1 percent) of the analysis area. The following allotments have the majority of the dormant landslide acres: Fox (213 acres), Juniper Butte (260 acres), Lone Pine (363 acres) and North (168 acres)

Dormant landslides tend to occur on slopes greater than 40 percent and are generally associated with ridge tops. They originate on the Clarno and John Day Formations. The slide planes tend to be located on clay lenses within the Clarno and John Day Formations although shallow slides do occur in the overlying soils developed from these two formations. When the dormant landslides were more active they contributed to of the existing alluvium now occupying the flood plains of stream courses. Mud Springs Creek is one example of this.

Vegetated lineation, drainage development, small scarps, spring, and moist areas are the physical traces of the past tectonic and superficial movement. Within the past 100,000 years the present day stream systems developed and mass-wasting events shaped the slopes. More recently, within the past 6,900 years, a succession of volcanic ash falls from nearby Mt. Mazama and Newberry Crater carpeted the terrain.

3.4.2.2 Streams

The landslide debris and the pyroclastics (rock material broken into fragments through volcanic or igneous action) of the Deschutes, Madras, Simtustus, John Day, and Clarno Formations contribute to the fine sediments present in the stream substrate. This type of lithology tends to generate clay and silt fines as it erodes. The basalts, andesites, and rhyolites, like the Columbia River Basalts, contribute to the gravel component (being more resistant to erosion)

The dormant landslides on the Crooked River National Grassland were probably active at some time during the past 100,000 years. They were probably triggered by combined tectonic activity and high precipitation. They establish a dynamic equilibrium through natural processes as the streams cut the toes of the landslide debris and as natural fires, insect and disease infestations removed vegetation, allowing increased precipitation to saturate the soils. Due to the dryer climate of the Grassland reactivation of dormant landslide terrain is less likely to occur. However, sudden intense summer thunderstorms have been known to initiate debris flow events in arid and semi-arid areas (Kaatz 2001). The Deschutes river system has experienced these events, as has the Crooked River system. A series of dormant landslides "toe out" along Mud Springs Creek.

Channel, sheet and rill erosion are the current dominant erosion processes across the analysis area under the current climatic conditions.

3.4.2.3 Paleontology

The paleontological significance of the Madras/Terrebonne area is proving to be more important than previously realized. The slopes on the west side of Gray Butte hold a wealth of leaf fossils in the John Day and Clarno Formations. Collection is occurring and monitoring is limited. This area provides a unique window into a past topographically isolated environment, apparently distinct from other paleo-environments of the same time period in the John Day basin. It is considered both nationally and internationally important for complete terrestrial exposures of the climate transition from tropical to semi-temperate dating from 50 to 27 million years.

The upper part of the Tertiary is also proving to be climatically variable. This is the time frame for the Simtustus, Madras, and Deschutes Formations. Fossil fauna and flora are present in the watersheds.

Vertebrate fossils are exempt from collection by the public.

3.4.2.4 Caves

There are no caves present on the Grassland within the analysis area.

3.4.2.5 Water Source

The Ochoco National Forest and Crooked River National Grassland established a water well drilling program to reduce impact on surface water sources and updated the water conservation plan in 1996 (Gordon 2004, Appendix B). Currently there are no federal producing water wells located on the Grassland; however, there are a number of private livestock wells. Haystack Reservoir (D5.1), The Main Canal System (D5.2), and Squaw Flat Well (D5.3) are the designated water sources.

Potential for drilling a successful well is low (Deschutes Groundwater study, 2001 as cited in the Minerals and Geology Report). The Clarno Formation underlies the area. The formation is considered part of the older volcanic aquifers (Gonthier 1985).

The aquifer has low permeability throughout the Clarno Formation. This characteristic is due in part to the alteration of volcanic minerals to clay and to the deposition of secondary minerals in the fractures and joints.

Most wells in this aquifer yield less than 10 gallons per minute. Estimated annual recharge to the aquifer ranges from 1 to 2 inches per year. Dissolved solids range from 96 to 1,100 mg/L. Oregon State and EPA secondary water quality (other than drinking water) standards suggest 500 mg/L dissolved solids (Gonthier 1985). The water quality is generally good.

Low hydraulic properties combine to make this a generally poor aquifer unit capable of yielding small amounts of water for domestic (residential) or livestock use.

3.4.3 Environmental Effects

3.4.3.1 Direct and Indirect Effects

3.4.3.1.1 Mass Wasting for Alternatives A and B

These alternatives would not likely have a direct effect on slope stability. There would be no treatments on or adjacent to dormant landslide terrain.

Alternative A and B have 1,127 acres of dormant landslide terrain under no action and current grazing practices/actions (Table 3-15).

Table 3-15 Dormant Landslide Terrain by Allotment, Alternatives A and B

Allotment	Pastures (acres) of concern	Dormant Landslide Terrain (Acres)	% Dormant Landslide Terrain
Blanchard (7,694 acres)		27	<1%
Boyce (5,653 acres)		0.3	<1%
Cyrus (9,325 acres)		43	<1%
Fox/Dump (6,225 acres)		213	3
	Mud Springs (1,094 acres)	178	16>
Holmes-Squaw Creek (6591 acres)		49	1

Juniper Butte (7,554 acres)		260	3.4
	South Haystack (883 acres)	190	22>
Lone Pine (9,222 acres)		363	4
	Burn (603 acres)	114	19>
	Pine Ridge (1,098 acres)	214	19>
Lower Desert (11,711 acres)		3	<1%
North (10,251 acres)		168	2
Peninsula (1,680 acres)		1	<1%
Total Acres		**1,127**	

Under natural processes the dormant landslide terrain in these two alternatives has the potential for shallow debris flows on the steeper terrain. It would take a combination of root strength deterioration and a saturated soil condition to initiate debris flows. The likelihood of this occurring is relatively small.

3.4.3.1.2 Mass Wasting for Alternatives C and D

While proposed management activities including grazing, prescribed fire, tilling/seeding/fertilization, and juniper control using mechanical and chainsaw methods have the potential to effect soil productivity, the rate of erosion and soil microorganisms, they are not likely to have a direct effect on the slope stability.

There is a low potential for debris flows to reach streams. There are existing 50-100 foot wide vegetated buffers along streams that would not be treated. Stream buffers will protect the toe slopes of the dormant landslide terrain.

Table 3-16 lists the dormant landslide terrain acres by allotment and by unit for Alternatives C and D.

Alternative C would treat approximately 204 acres of dormant landslide terrain and Alternative D, approximately 153 acres. The magnitude of difference (acreage) in the risk between Alternatives C and D is negligible. There is a slightly increased risk for reactivation of the dormant landslide terrain under Alternatives C and D compared to Alternatives A and B. It would take a combination of root strength deterioration and a saturated soil condition (due to a high intensity storm or a rain-on-snow event) to initiate debris flows. The likelihood of the specific combination necessary to initiate debris flows is relatively small.

Table 3-16 Alternatives C and D, Dormant Landslide Terrain by unit and treatment

Unit	Alternative	Allotment/Pasture	Treatment	Acres of Dormant Landslide Terrain	Total Acres	% Dormant Landslide Terrain
32	C, D	Cyrus/W. Cyrus	Chainsaw	35	387	9
33	C, D	Juniper/S. Haystack	Chainsaw	31	269	12
37	C, D	Juniper Butte/Hiway	Chainsaw	2	337	<1
58	C, D	Fox/N. Fox	Chainsaw	19	887	2
75	C	Blanchard/Middle	Chainsaw	22	1030	2
79	C	Peninsula/North	Chainsaw	5	509	1
87	C	Blanchard/Juniper	Chainsaw	1	2419	<1
3	C, D	North/W. Parkey	Chainsaw, Prescribed	11	621	2

			Fire			
14	C, D	Blanchard/Bennett Spring	Chainsaw, Prescribed Fire	3	1262	<1
44	C, D	Fox/Mud Spring	Chainsaw, Till, Seed, Fertilize	32	204	16
1	C, D	North/E. Coburn	Prescribed Fire	15	813	2
9	C, D	North/North	Prescribed Fire	27	510	5
			Total Acres	**203**	**9248**	**2**

There are nine units in common between Alternatives C and D. Eight units are at risk for reactivation of the dormant landslide terrain from management activities.

- Unit 1 (Old Maid's Canyon) contains one dormant landslide (15 acres) on steep terrain and the toe is adjacent to the creek.
- Unit 3 has two small dormant landslides (11 acres) on steep terrain located in the southeast corner of the unit.
- Unit 9 has three dormant landslides (27 acres) of which one is steep and toes out on a creek.
- Unit 14, on Willow Creek, along Rd 5340-061, has one dormant landslide (3 acres) on steep terrain and adjacent to the creek.
- Unit 32 has one flat dormant landslide (35 acres) adjacent to a creek.
- Unit 33 has one steep dormant landslide (31 acres).
- Unit 44 in Mud Springs Creek has four dormant landslides (32 acres) on shallow to flat slopes.
- Unit 58 has one dormant landslide (19 acres) on moderately steep slopes.

The two additional units at risk associated with Alternative C only are:

- Unit 75 has one flat dormant landslide (22 acres).
- Unit 79 is adjacent to Cove Palisades State Park. The rim on the west side of the unit is a landslide scarp. The juniper thinning will most likely occur on the mesa, not on the western slope. The dormant landslide terrain is 5 acres and relatively steep.

3.4.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Under Alternatives C and D juniper removal with prescribed fire, cutting with chainsaws, or a combination of both may, in addition to the ongoing and future foreseeable actions, have low indirect and cumulative effects on the dormant landslide terrain. There would be a slight increase in potential for debris flows 5-10 years after the juniper is cut or killed by fire. This would be dependant upon the occurrence of a high intensity storm or ground saturation event.

Overall, the difference between cumulative effects of the alternatives for minerals and geology is minimal. The dormant landslide terrain in all the alternatives has the potential for shallow debris flows on the steeper terrain under natural processes. The minor difference of treated landslide acres between Alternative C and D is negligible. The majority of units of concern are in both alternatives. There is a slightly increased risk for reactivation of the dormant landslide terrain under Alternatives C and D as compared to Alternatives A and B. It would take a specific of root strength deterioration of the treated areas and a saturated soil condition to initiate debris flows. The likelihood of this specific combination occurring is relatively small.

Alternative D presents a slightly lower risk of slope instability than Alternative C.

3.4.4 Forest Plan Consistency

There are no LRMP goals, objectives, desired future conditions, or standards and guidelines for geology relative to the actions proposed in this FEIS.

3.5 Soils

3.5.1 Current Management Direction (FSM, Laws, and regulations, etc.)

The goal of the LRMP is to manage soil to maintain, restore, or improve its natural productive potential.

The objective of the Crooked River National Grassland is to prevent or correct soil damage associated with all activities.

In the future, 10 years and beyond, soil productivity would be conserved; where productivity has been impaired areas will be rehabilitated through management activities.

3.5.1.1 The Regional Standards and Guides for Soils State the Following Under Policy:

2520.3 Policy

Design and implement management practices which maintain or improve soil and water quality. Emphasize protection over restoration. (USDA 1998)

When initiating new activities:

- Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area (this includes the permanent transportation system).
- In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
- In areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must at a minimum, not exceed the conditions prior to the planned activity and should move toward a net improvement in soil quality.

Application of Soil Quality Standards (USDA 1998):

"The standards and guidelines apply to lands where vegetation and water resource management are the principal objectives. (For example, timber sales, grazing pastures, or allotments, wildlife habitat, riparian reaches, and burn areas.) These standards and guidelines do not apply to intensively developed sites such as mines, developed recreation sites, administrative sites, or rock quarries.

a. Planning. Use soil quality standards to guide the selection and design of management practices and prescriptions on a watershed scale. Evaluate existing soil conditions on all ownerships within the watershed and consider cumulative effects with the addition of proposed actions on ecosystem sustainability and hydrologic function. On a planned activity area, evaluate existing soil conditions and design activities to meet soil quality standards. Document adjustments to management practices, soil conservation practices, or restoration techniques necessary to meet threshold values for the affected soil properties and watershed conditions.

b. Monitoring.

(1) Watershed Condition Classes. Each forest needs to monitor watershed condition (FSM 2521.1) and track trends in overall soil quality over time through landscape scale assessments such as watershed analysis (MAR 82.5, 82.6, 82.7.)

(2) Implementation Monitoring. During and following completion of projects, document whether management practices are, or were, implemented as prescribed.

(3) Effectiveness Monitoring. Document if the cumulative effects from applied management practices within an activity area met soil quality standards as defined. Base assessments on appropriate sampling design and procedures. For example: R6-RWM-146-1983, "Sampling Some Physical Conditions of Surface Soils." Appropriate quantitative or qualitative techniques may be used.

(4) Validation Monitoring. Where there are significant gaps in knowledge, collaborate with research organizations, adjoining Forests, Universities, Private Industry and other local interested groups to establish studies to fill the knowledge gaps."

3.5.2 Affected Environment

3.5.2.1 Pre-Euro-American Settlement

Prior to Euro-American settlement, natural erosion processes occurred throughout the area. Natural erosion processes continue today and are modified by man's influences. These influences primarily affect soil surface horizons. Fire, grazing ungulates, root gathering by Native Americans, summer thunderstorms, and spring runoff events all affected soils. Overall effective ground cover, defined as ground cover that intercepts and interacts with precipitation and runoff, was probably higher than it is today. Early accounts (David 2004) point to the fact that rates were much lower over much of the landscape, especially in regards to channel erosion. Background erosion rates cannot be quantified at this time due to lack of available data

Identifying background erosion rates is extremely difficult. Background erosion varies tremendously due to geology. Background erosion rates are higher in the 9 to 16 inch precipitation zones throughout the arid west, including the Grassland, because the effective ground cover is often less due to a lower percentage of effective plant cover.

3.5.2.2 Post Euro-American Settlement

Dryland farming, roads, homesteading, and bovine/equine influence were the major impacts following European settlement. Much of these major impacts from bovine/equine livestock occurred prior to 1900 (David 2004).

Grazing has been a major factor in the cumulative impacts of Euro-American settlement. Past overgrazing caused soil compaction, loss of effective cover, head cutting, post holing, and plugging. Some impacts occurred from elk but most were due to the concentrated herds of cattle, horses, and sheep starting in the mid to late 1800s through the early 1900s.

Farming/homesteading resulted in major increases in wind and water erosion due to the reduction of year round ground cover in farm fields and intensively grazed farm paddocks. The actual location and acreage of these homesteads is not spatially locatable due to insufficient historical records. However, the edges of the old homesteads can still be identified by large dune buildups along old fence lines. Streams were channelized and rerouted for irrigation and stock ponds thereby increasing bank erosion. Year-round grazing pressure was intense, especially on the relatively small 160 to 320 acre homesteads. Today, historically dryland farmed and heavy livestock concentration areas (barnyards) may be depleted of primary soil nutrients and retain only partial A-horizons.

The Grassland may still be referred to as "the marginal" from a livestock forage production standpoint due to its relatively dryness and lower productivity compared to the forested uplands of the Ochoco Mountains to the east and to the more productive agricultural lands toward Culver and Madras (Fessler 2000).

There are approximately 1,543 miles of roads located on all lands within the nine watersheds and subwatersheds in which the Grassland is located. Approximately 467 miles (934 acres) are Forest Service system roads located on Grassland administered lands and maintained by the Forest Service. The total road miles on Grassland administered lands, maintained by: the Forest Service, Jefferson County and Oregon Dept. of Transportation, is 819 miles or 1638 acres. This is a 4.7 mi/sq mi density (USDA 2003). Trail mileage (including hiker, horse, and Off Highway Vehicle (OHV)) totals approximately 55 miles (55 acres) (USDA 2003). This figure includes some overage to account for unmapped trails. Approximately 1.5 percent of Grassland administered lands are currently dedicated to roads and trails and not available for other resource activities.

There are approximately 850 miles of interior and boundary fence lines on the Grassland. These fence lines are maintained by livestock permittees. Permittees are allowed to use motorized vehicles to access fence lines for purposes of: maintenance, repair, construction, and reconstruction. Assuming a "road" width of 10 feet, it is estimated that there are approximately 1,030 acres associated with such roads to provide access to fence lines. This is approximately one percent of the Grassland allotment land acreage.

There are 205 existing water developments located on Grassland managed lands. Each water development is estimated to include approximately one acre of land immediately adjacent to the development that has detrimentally impacted soils associated with livestock use of the development. Impacts include compacted, displaced, and exposed soils. These areas are generally denuded of vegetation. The estimated 205 acres of detrimentally impacts soils associated with the existing developments is approximately 0.2 percent of the Grassland acres associated with grazing allotments.

Many of the homesteads were purchased by the Federal Government in the 1930s and were managed by the Soil Conservation Service (SCS). The Forest Service took over management in 1954. Between 1930 and the 1960s, approximately 64,000 acres were: tilled, seeded, treated with herbicide, and/or burned, with the objective of stopping erosion and returning productivity to these lands. The seedings helped to reduce wind erosion. The brush control, through use of herbicides and burning, favored establishment and maintenance of the planted grasses.

Table 3-11 Acres of seeding, herbicide application, and burning conducted by the Soil Conservation Service (SCS) and the Forest Service, 1930 through 1970.

WATERSHED	ACRES TREATED 1930-1970	PERCENT OF WATERSHED
Crooked River Grasslands	5,308	9
Deschutes South	7,844	21
Lake Billy Chinook	2,764	4
Lower Crooked R. Valley	2,823	5
Lower Metolius	680	3
Mud Springs Creek	4,619	8
Steelhead	32	0.1
Whychus	845	4
Willow Creek	20,919	25
Total	**45,839**	

Table 3-17 (above) displays the number of Grassland acres treated by watershed. These acres roughly correlate to the past level of disturbance by watershed. The old fields were the primary targets for treatments. As evidenced by the table below much of the homestead impact was concentrated in the Willow Creek and Deschutes South watersheds.

3.5.2.3 Data Sources

Soils information was obtained from the following data sources:

- Soil Resource Inventory - Ochoco National Forest, USDA Forest Service, Pacific Northwest Region.
- Soil Survey of Upper Deschutes River Area, Oregon, including parts of Deschutes, Jefferson and Klamath Counties (David 2004, page 5).
- Soil Survey of Trout Creek- Shaniko Area, Oregon (Parts of Jeffferson, Wasco and Crook Counties) USDA, Soil Conservation Service and Forest Service in cooperation with Oregon Agricultural Experiment Station.

3.5.2.4 Past Monitoring

3.5.2.4.1 Soil Compaction

Many of the old seeding areas have been monitored for compaction levels. This monitoring was a site-specific shovel probe transect across representative portions of the seedings. This method of monitoring is a subjective measure of relative compaction levels. A shovel is used to probe soils at regular intervals across a representative cross section of the area of interest. This allows for the determination of the relative percentages of compacted versus un-compacted or slightly compacted soils.

Detrimental compaction is defined as a 15 percent increase in soil bulk density in residual soils and a 20 percent increase in bulk density in ashy soils. On the Grassland, this increase has largely been associated with past homesteading activity and the hooves of livestock.

Detrimental compaction reduces surface soil porosity that in turn results in reductions in water infiltration, percolation, and air exchange in the soil. There is also an increase in resistance to root growth.

The effects of detrimental compaction associated with livestock are primarily shallow, short-lived, and seasonal in nature (David per. comm. 2004). They have short-term effects on overland flow, particularly when associated with summer thunderstorms. During these storm events, they may result in an increase in peak runoff and cause more surface and bank erosion than on ungrazed soils. In a study on a sandy loam soil in Wyoming, "*No significant differences in infiltration between stocking {moderate and heavy) existed in the spring, indicating that the freeze-thaw activity each winter alleviated any detrimental soil compaction that reduced infiltration.*" (Abdel-Magid 1987). Most of the surface soil textures on the Grassland are sandy loam in nature and are similar to the above mentioned study.

Detrimental compaction is present in some areas but is not as prevalent as once thought (David pers. comm. 2004). Natural remediation through frost action, shrub, and deep-rooted grass establishment, the action of soil organisms, and rodents has helped to ameliorate the compaction of much of the surface horizons (upper 12 inches of the soil profile). Deeper compaction from old farming activity is likely to be far more persistent and is harder to assess with shovel probing.

Site specific monitoring was performed during the winter and spring of 2003 for potential treatment areas. The following pastures were monitored via shovel transect.

- **Boyce Allotment**
    - South Boyce Pasture
    - Boyce Pasture
    - Road Pasture
    - Canal Pasture
    - Windmill Pasture
    - Grant Pasture

- **Rush Allotment**
    - East Rush Pasture
    - West Rush Pasture
    - Healy Pasture

- **North Allotment**
    - Mud Springs

These areas were selected due to the high potential for compaction associated with past activities (previously homesteaded and farmed sites where the greatest probability exists today for compacted soils). They were sampled to gain a more detailed understanding of persistent compaction in these formerly high impact areas and do not necessarily represent treatment units.

Results

With the exception of areas around water developments and pasture corners, the only pasture sampled with greater than 20 percent detrimental soil compaction (Region-6 soil management standards threshold for a particular unit/pasture in a moderate to heavy compaction class) was the Healy Pasture due to historic cumulative impacts.

See also Map 19– Soil Compaction Hazard which displays relative compaction hazard levels throughout the CRNG.

3.5.2.4.2 Infiltration Monitoring: Some informal field monitoring was conducted in the early 1990s by the forest soil scientist (J. David) and the forest hydrologist (B. Anderson) with an improvised field infiltrometer. This monitoring was conducted on grazed and ungrazed paired samples along the 6080 road in an area of Caphealy-Reuter soil complex in early fall. Caphealy soils are deep with ashy sandy loam surface profiles and Reuter soils are shallow (<20 inches) with ashy sandy loam surface profiles. The grazed soils took three times longer for the water to infiltrate than did the ungrazed road shoulder area (3 minutes versus 9 minutes). This illustrates the seasonal hoof compaction effect on ashy sandy loam surface textures. This may contribute to flashier sheet and rill runoff during summer thunderstorms and fall/winter rains. The project design criterion of leaving adequate stubble heights (FEIS, Chapter 2, Section 2.4.1) helps provide the hydraulic roughness necessary to decrease this potential effect.

3.5.2.4.3 Condition and Trend Plots- Surface Soil Features

Monitoring of the soil resource has also been accomplished through the recent (2001) reading of condition and trend plots. These were Condition and Trend Cluster transects (Parker 1951) established in the 1950s and 1960s. The trends listed under Soil Surface refer to the percent ground cover occupied by plants and litter versus bare soil and erosion pavement.

Results

See FEIS, Chapter 3, Table 3-11 which indicates that Soil Surface Trend was upward on 18 (58 percent) of the clusters, static on 8 (26 percent) of the clusters and downward on 5 (16 percent) of

the clusters. This is a strong indication that there has been an incremental increase toward more stable surface soil conditions especially when compared with the dustbowl conditions during and after the homestead era.

3.5.2.4.4 Ecological Trends: 2001 Range Ecological Site Condition and Trend Survey (NRCS National Range and Pasture Handbook) Soil Factors

Trend is either moving toward the historical climax, static (change not detectable), or moving away from the historic climax. Of the eleven factors considered in the NRCS survey, five are "Plant Factors" and six are "Soil Factors" (FEIS, Chapter 3, Section 3.0.1.3). The soil factors monitored are: surface erosion, crusting, percent of bare soil, presence of gullies and rills, overall soil degradation and the presence of plant residues and litter.

Specific soil attributes assessed on each transect included: rills, water flow pattern, pedastalling, bare ground, gullies, wind erosion, cryptogamic crusts, soil surface, infiltration and runoff, and litter distribution and amount. Different categories were assigned for each attribute (USDA Natural Resources Conservation Service, 1997).

Results

Of the 24 allotments monitored, 40 percent of the acreage is moving toward historical climax conditions, 51 percent of the acreage is static and only 9 percent of the acreage is moving away from historic conditions.

Range health factors show that 41 percent of the acreage has none to slight deviation from stable conditions, 37 percent of the acreage shows slight to moderate deviation from stable conditions, 16 percent of the acreage shows moderated deviation from stable conditions and only 6 percent shows moderate to extreme deviation from stable conditions. One percent of the acreage shows extreme deviation from stable conditions (FEIS, Chapter 3, Section 3.3). Again, these recent monitoring efforts show an incremental upward trend from the dustbowl conditions of the homestead era that precipitated the conservation measures, which have been implemented to date.

3.5.2.5 Description of the Soil Resource

The Grassland contains a wide variety of soils and land types. Parent materials are one-third basalts and andesites, one-third sedimentary rocks, and one-third highly weathered tuffaceous sediments.

The area was generally blanketed by Mt. Mazama ash approximately 6,900 years ago and subsequently eroded and deposited by water and air. In general ash soils occur on steep north aspects, in canyons, and on northern and eastern aspects of buttes and mountains throughout the grasslands. The remainder of the area is largely residual soil, which has a clay-loam or clay texture. Refer to the Appendix P for specific treatment unit soils information (Map 13 - Soil Resource Inventory Map).

3.5.2.5.1 Generic Grouping of Broad Soil Categories:

Table 3-18 (below) displays the percentages and acreages of ash and shallow soils on the Grassland by watershed. It also displays the percent of each watershed with slopes over 30 percent.

3.5.2.5.1.1 Shallow Soils

The percentage of shallow soils in each watershed ranges from seven percent in the Lower Crooked River Valley to 39 percent in the Whychus watershed, largely due to basalt flow influence. Deeper

soils occur where basalt flows are absent. Shallow soils correspond to basalt flows and are less than 20 inches in depth. Shallow soils come in all textures or combinations thereof.

The percentage of shallow soils can often be correlated with how flashy a system is, or the rapidity of runoff. In general, most of the proposed tillage, seeding, and fertilizing treatments are proposed on moderately deep to deep soils. Shallow soil inclusions may exist within a proposed project.

Table 3-12 Percentage of Ash and Shallow Soils and Slopes Over 30%, Crooked River National Grasslands.

Watershed	Percent / Acres Shallow Soils	Percent / Acres Ash Soils	Percent Steep Slopes (>30%)
Crooked River Grassland	28% 15,847 ac	21% 11,455 ac	15
Deschutes South	26% 9917 ac	15 % 5677 ac	7
Lower Metolius	30% 6380 ac	8% 1702 ac	5
Mud Springs	20% 11560 ac	19% 11199 ac	6
Lake Billy Chinook	23% 14459 ac	31% 18906 ac	5
Lower Crooked River Valley	7% 4333 ac	9% 5703 ac	13
Steelhead Falls	25% 5851 ac	21% 5335 ac	6
Whychus	39% 8061 ac	25% 5105 ac	8
Willow Creek	10% 8865 ac	13% 10959 ac	6
TOTALS	**85273 ac**	**76041 ac**	

3.5.2.5.1.2 Ash Soils

The percentage of ash soils ranges from eight percent in the Lower Metolius Watershed to 21 percent in the Lake Billy Chinook Watershed. The combination of a high percentage of shallow soils and low percentage of ash soils makes the Lower Metolius Watershed one of the least productive watersheds on the Grassland.

Ash soils can and do erode more readily than other soils but are more productive generally. The physical properties (single grain structure) associated with ash soils lend themselves to higher inherent productivity as well as a higher potential for erosion.

With deeper ash soils (20 to 80 inches depth), there is more potential for soil remediation such as tillage and fertilization.

3.5.2.5.1.3 Steep Slopes

Of the watersheds included in this analysis, the Crooked River Grasslands and the Lower Crooked River Valley Watersheds contain the highest percentage land base with over 30 percent slopes (15 percent and 13 percent respectively). The Crooked River Grasslands Watershed also contains the greatest acreage of 50 to 70 percent slopes (4 percent or 2076 acres).

Steep slopes are least suited for mechanical treatments and are potentially the most erosive. The probability of prescribed fire impacting soil resources is dependant upon: existing ground cover, soil texture, severity of fire, and post fire weather.

3.5.2.5.1.4 Clay Soils

Clay subsoils characterize a major component of the Grassland soils. See soil classification in Table 3-19 (below). The major variable with clay soil is its depth below surface ash. Ash that is nearer to the surface is at higher risk for detrimental displacement and compaction. Clay soils such as the Lickskillet soil series have higher runoff rates and are generally less productive. If the heavy clay is at the surface there is little potential for detrimental compaction (the clay in this area is 2:1 high shrink-swell smectitic clay which swells and cracks with each yearly wet season). These soils are generally more susceptible to medusahead grass invasion as medusahead appears to favor heavier soils (soils with greater clay content). This is a result of medusahead's ability to colonize clay sites.

3.5.2.5.1.5 Physiography/Zonal Vegetation

Zonal vegetation is primarily a result of the climate and associated soils. Most of the Grassland is non-commercial timber ground consisting of: big sage steppe, juniper steppe, and juniper woodland plant communities. There are small areas of rock outcrop, low site ponderosa pine, low sage scabland, meadow, and fir plant association groups (less than 100 acres).

The major physiographic features are rolling plateaus, hills, buttes (Gray Butte, Haystack Butte, Juniper Butte, etc.), one mountain (Grizzly Mountain), steep rimrock escarpments along the major drainways, steep slopes along drainways, and drainway bottoms such as in the Lower Crooked River and Deschutes River.

3.5.2.5.1.6 Microbiotic and Vesicular Crusts:

Microbiotic crusts occur to some degree over most of the CRNG. They are most evident in the spring time. Historically these crusts were probably more evident than today especially due to impacts from the homestead period. Microbiotic crusts and the closely associated vesicular crust (a platy surface crust, usually 1.5 to 3 inches which is formed by raindrop impact and contains vesicular pores) form a thin surface layer comprised of biotic and abiotic features. The vesicular crust along with the microbiotic crust (if present) provides a resistant layer to surface, rill erosion, and wind erosion.

Biological soil crusts, also known as microbiotic crusts, cryptogrammic crusts, or cryptobiotic crusts, are an important part of the arid and semi-arid ecosystems of the intermountain west. These crusts are composed of lichens, mosses, microfungi, bacteria, and green algae that grow on top of the soil in a rough, uneven carpet, in the interspaces between shrubs and grasses. They function as "biological mulch", helping to reduce wind and water erosion, fix atmospheric nitrogen, contribute to soil organic matter, retain soil moisture, enhance vascular plant regeneration, and help prevent noxious weed establishment, including cheatgrass (USDI 2001).

Hot fires will generally kill biological crusts (USDI 2001) but historic fires in the area (pre-suppression) are thought to have been of low-intensity. A crust's structural matrix is generally left intact by low-intensity fire (USDI 2001) and unburned patches act as refugia to provide propagules to colonize burned areas.

Sometime in the past century, cheatgrass (*Bromus tectorum*) entered the project area and has never left. This species is an annual exotic grass and as such can pose a long-term threat to biological soil crusts (USDI 2001). Such invasions have been shown to inhibit crust development (USDI 2001).

Microbiotic crusts were much more prevalent before the homestead period based on personal observations of the area known as the Island which has not had significant grazing impacts. Heavy grazing can and does harm microbiotic crusts and the recovery of these crusts is slow especially in semi-arid environments such as the CRNG. Microbiotic crusts do appear to be re-establishing on many sites such as under juniper canopies and throughout heavier brush stands throughout the CRNG (J. David, pers. comm. 2004).

3.5.2.5.1.7 Mycorrhizal Associations

Only three genera of vesicular-arbuscular mychorrhizae (VAM) fungi are known to form associations with plants in the shrub-steppe habitat of southwestern Idaho and Eastern Oregon: *Glomus* (Tul), *Gigaspora* (Gerdemann and Trappe), and *Acaulospora* (Gerdemann and Trappe). In arid soils, shrubs establish themselves in patches or clumps and form "fertility islands". These islands are also sites of highest VAM activity. These patches serve as inoculum focal points from which vegetation and VAM can spread. With greater shrub establishment, adequate VAM inoculum would be concentrated to initiate mychorrhizae on later successional plants (Wicklow-Howard 1994). For this reason, existing sagebrush islands are not proposed to be treated under the action alternatives.

3.5.2.5.2 Predominate Soil Series of the Grassland

Table 3-19 (below) displays the predominate soil series, family classification, and related vegetation. That is, the listed vegetation types generally exist on corresponding soils (as listed).

Table 3-13 Predominant Soil Series in the Analysis Area

Siol Subgroup Classification	Particle Size	Soil Series	Range, Woodland, Forest Species For type location
Aridic Argixerolls	Fine-loamy	Madras	western juniper, mountain big sage, basin big sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue
Vertic Palexerolls	Fine	Simas	bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, Wyoming big sagebrush
Aridic Haploxerolls	Fine-loamy	Agency	western juniper, bitterbrush, bluebunch wheatgrass, Idaho fescue
Lithic Haploxerolls	Loamy-skeletal	Lickskillet	bluebunch wheatgrass, Sandberg's bluegrass, Thurbers needlegrass, yarrow, Wyoming big sagebrush
Lithic Argixerolls	Clayey	Cullius	western juniper, basin big sagebrush, bitterbrush, bluebunch wheatgrass, Idaho fescue
Vitritorrandic Haploxerolls	Coarse-loamy	Era	Needle and thread grass, Idaho fescue, basin big sagebrush, bitterbrush
Humic Vitrixerands	Ashy	Wanoga	ponderosa pine, western juniper, bitterbrush, mountain big sagebrush, Idaho fescue
Lithic Haploxerolls	Loamy-skeletal	Bakeoven	Sandberg's bluegrass, rigid sage
Haplic Durixerolls	Clayey-skeletal	Gribble	Idaho fescue, bluebunch wheatgrass, Sandberg's bluegrass
Aridic Argixerolls	Loamy-skeletal	Searles	bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, Wyoming big sagebrush, bitterbrush, western juniper

Vertic Argixerolls	fine	Tub	bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass
Vertic Palexerolls	fine	Hankins	ponderosa pine, Douglas fir, elk sedge, Idaho fescue

For more in depth information on the soils on the Grassland, see Appendix V - Soil Series Descriptions for further detail, Appendix S - Table of Estimated Tillage Suitability for information related to tillage, Appendix T - Table of Shallow or Clay Soils for information pertinent to medusahead invasion risk, and Appendix P - Soils Within Treatment Areas by Watershed for information relevant to the proposed vegetation treatment units and Appendix AB- Soil and Map Unit Field and Publication Symbols.

3.5.3 Environmental Effects

3.5.3.1 Generic Effects to Soils from the Proposed Activities:

3.5.3.1.1 Cattle Grazing Effects on Soils:

3.5.3.1.1.1 Direct and Indirect Effects:

These impacts to the soils resource include physical impacts such as:

3.5.3.1.1.1.1 Compaction Defined as a decrease in soil bulk density caused by cattle hooves which reduces surface soil porosity. This causes reductions in water infiltration, percolation, and air exchange in the soil. There is also an increase in resistance to root growth. Detrimental compaction is defined as a 15 percent increase in soil bulk density for residual soils and a 20 percent increase in bulk density for ashy soils. As discussed below this effect is largely seasonal. These effects do have short-term impacts on overland flow especially for summer thunderstorms. This may increase the runoff peak and cause more surface and bank erosion than on ungrazed soils.

These effects are usually shallow, short lived, seasonal compaction on sandy loam textured surface soils (Ahmed H. et al., 1987). In this study on a sandy loam soil in Wyoming, "No significant differences in infiltration between stocking (moderate and heavy) existed in the spring, indicating that the freeze-thaw activity each winter alleviated any detrimental soil compaction that reduced infiltration."

Based on 15 years of personal observation on the CRNG in the early spring, the grazing season surface soil compaction appears to be ameliorated by winter freeze/thaw action for these ashy sandy loam surface textures also. (J. David pers. comm. 2004)

3.5.3.1.1.1.2 Post-holing and plugging via hoof action. Hooves shear the protective sod mats and create holes and mixing throughout which induces a condition that is susceptible to rill and gully formation. Commonly these areas appear hummocky and show signs of erosion in between the hummocks. This can be particularly damaging around wet meadows, springs, seeps, and streams. However, since these areas are largely fenced out on the CRNG there is little potential for impacts.

3.5.3.1.1.1.3 Bank erosion due to sloughing caused by cattle impacts to banks (on all classes of streams besides those which are currently excluded from grazing.): Hoof action, rubbing and wallowing commonly cause bank failure on streams with banks composed of fine alluvium such as sand, silt, clay and gravels. This results in more sediment delivery to the stream especially during high flow events. Live water along streams such as Willow Creek and Mud Springs Creeks are excluded from cattle grazing. Where potential impacts are still of concern is

along Class 4 drainways which have a defined channel but do not have live water or riparian vegetation (Platts and Nelson, et al).

Class 1- 4 streams encompass 1,241 acres within the Grassland, or about four percent of the Watershed area within the Grassland. About three and a half percent (1,086 acres) of this riparian area is classified as intermittent non fish bearing stream (see Fisheries Report).

The total miles of class 4 stream in the total Watershed area (including private ground) is 821 miles, of which most is grazed (see Hydrologist Report). This has the potential to contribute sediment to downstream areas during the short, late winter and early spring runoff period (maybe 1 to 2 weeks of runoff every 5 years). This sediment contribution has not been quantified due to lack of data.

3.5.3.1.1.1.4 Mixing and incorporation of organic matter into surface horizon: This has both positive and negative impacts. Mixing helps incorporate and conserve organic matter. It also reduces the mulching effect of organic matter which may leave the soil somewhat less protected from wind and water erosion (Potter, Daniel, Alton and Torbert, et al), (Schuman et al., 1998).

3.5.3.1.1.1.5 Microbiotic and Vesicular Crusts: Microbiotic crusts occur to some degree over most of the CRNG. They are most evident in the spring time. Historically these crusts were probably more evident than today especially after the homestead period. Microbiotic crusts and the closely associated vesicular crust (a platy surface crust, usually 1.5 to 3 inches which is formed by raindrop impact and contains vesicular pores) form a thin surface layer comprised of biotic and abiotic features. The vesicular crust along with the microbiotic crust (if present) provides a resistant layer to surface and rill erosion as well as wind erosion.

Arid soils appear particularly vulnerable especially in regards to microbiotic crusts. These crusts are easily disturbed by livestock hoof action. This breaks up the crust and causes desiccation and increases susceptibility to wind and water erosion (Harper and Marble, et al).

Hot fires will generally kill biological crusts (USDI 2001) but historic fires in the area (pre-suppression) are thought to have been of low-intensity. A crust's structural matrix is generally left intact by low-intensity fire (USDI 2001) and unburned patches act as refugia to provide propagules to colonize burned areas.

In a study in Idaho, burning resulted in significantly reduced shrub cover and enhanced annual grass and annual forb cover compared with unburned sites. Burning also resulted in substantially reduced diversity and richness of crust taxa, increased cover of short mosses, but reduced cover of lichens and tall mosses growing on the shrub hummocks. Post-fire recovery of perennial grasses and biological soil crusts was greatest on seeded sites compared with unseeded sites dominated by exotic grasses, despite the disturbance associated with the rangeland seeding treatment. The results indicate that seeding is necessary to facilitate recovery of biological crusts and hasten the development of the perennial component of the shrubland and therefore increase landscape structure. These findings suggest that seeding perennial grasses and resting from livestock grazing reduces exotic annual grasses after fire and benefits native mosses (Hilty, 2004). This research supports the CRNG proposal to seed with rangeland grass and shrub species especially on burned areas.

Sometime in the past century, cheatgrass (*Bromus tectorum*) entered the project area and has never left. This species is an annual exotic grass and as such can pose a long-term threat to biological soil crusts (USDI 2001). Such invasions have been shown to inhibit crust development (USDI 2001).

3.5.3.1.1.1.6 Soil microorganisms: Grazing animal behavior influences the distribution of nutrients to various landscape positions. Animals may graze in one area and move to another area to rest or drink. Dung and urine may thus be more plentiful in the resting area and around a watering place than in the grazing area, a fact affecting the soil fertility of both areas, resulting in a net transfer of nutrients from the grazed area to the resting and watering areas.

Grazing promotes nutrient cycling through rapid breakdown of organic matter into smaller particles in the system, so organic matter is available more readily for soil microorganisms such as soil bacteria and fungi. Microorganisms use the organic matter as an energy source and can release nutrients back into the soil for plant uptake. Thus, grazing may increase the rate at which nutrients cycle through an ecosystem. It may be argued that if nutrients are not bound up in soil or organic matter, then they are more vulnerable to being lost to the system. Management is important for ensuring that nutrient resources within the ecosystems are not depleted and that nutrients lost from the system are replenished through natural processes or by fertilizer additions (Krueger et al., 2002).

The diversity and abundance of soil organisms is influenced not only by available food resources, but by changes to physical and chemical properties of the soil. Studies in southern British Columbia have shown significant differences in prostigmatid mite populations (a common mite in tundra, desert, and tropical grassland habitats) in grazed and ungrazed sites. There were significant effects on mite populations due to season, depth and grazing as well as a significant season by grazing interaction (Battigelli, 1999). The significance of this difference in mite populations to soil function has yet to be determined.

3.5.3.1.1.1.7 Mycorrhizal Associations: Only three genera of vesicular-arbuscular mycorrhizae (VAM) fungi are known to form associations with plants in the shrub-steppe habitat of southwestern Idaho and Eastern Oregon. These genera are: *Glomus* Tul. and C. Tul., *Gigaspora* Gerdemann and Trappe and *Acaulospora* Gerdeman and Trappe. In arid soils; shrubs establish themselves in patches or clumps and form "fertility islands". These islands are also sites of highest VAM activity. In disturbed areas, the development of patches composed of shrubs and grasses should be planted. These patches will be inoculum focal points from which vegetation and VAM can spread. With greater shrub establishment, adequate VAM inoculum will be concentrated to inititiate mycorrhizae on later successional plants (Wicklow-Howard, 1994). For this reason, existing sage islands are not proposed to be treated with fire and tillage.

3.5.3.1.1.1.8 Soil Carbon Cycling and Sequestration: The large areas occupied by grazing lands, the diversity of their climates and soils, and the potential to improve their use and productivity all contribute to the great importance of grazing lands in sequestering Carbon (C) and mitigating the greenhouse effect and other aspects of global climate change (Follett et al., 2001).

Productive, sustainable grazing lands provide high-quality vegetation and soils, which lead to high rates of carbon sequestration and low levels of carbon dioxide (CO2) emissions (Krueger et al., 2002).

3.5.3.1.2 Juniper Cutting/Clearing Effects on Soils:

3.5.3.1.2.1 Direct Effects of Juniper Control: general:

Cutting western juniper reduces moisture, light and nutrient competition with understory species. Studies have shown that cutting western juniper increased forage production by a factor of 9 and forage nitrogen by a factor of 10 by the second year of cutting. There was no evidence that juniper cutting resulted in nitrogen losses from the site. Nitrogen loss after cutting is a concern in some forested ecosystems. Thus, on western juniper dominated sites, cutting is a viable option for restoring forage that can be used to sustain livestock and wildlife production. (Bates et al.,1997)

These results are contingent on leaving the cut material on site without burning- Lop and scatter of limbs with bole removal only.

3.5.3.1.2.2 Indirect effects:

Fire effects on nutrient levels is considered an indirect effect. If lopped and scattered then effects will be minimal. Additional benefits will be incurred if slash is left to provide some mechanical exclusion from grazing and to provide microsites for bunch grass growth. If piled then effects may be slightly more. Recommend leaving lop and scattered brush on site for several years.

3.5.3.1.2.3 Cumulative effects (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

Cumulatively treatments will reduce interception, stem flow, and rhyme ice formation. Evapotranspiration will be reduced in the short term (three years). Grass, forb, and browse production will be increased.

3.5.3.1.2.3 Mechanical Juniper Control and Harvest Effects on Soils:

3.5.3.1.3.1 Direct and Indirect Effects:

3.5.3.1.3.1.1 Compaction/Displacement: Detrimental compaction is defined as a 15 percent increase in bulk density for residual soils and a 20 percent increase for ashy soils. Multiple passes (from three to four passes with crawler tractors, rubber tired skidders or firewood trucks commonly produce this effect. The major effect is reduction in porosity resulting in reduced water and air availability to plant roots. There is also increased mechanical resistance to root growth. Mychorrizal symbiosis has been shown to be decreased also.

- **Detrimental Compaction -** this has a negative effect on soil productivity and fisheries. The reduction of soil pore space limits air, water and nutrient availability to roots. The reduction in infiltration results in higher peak flows and associated increased energy for erosion and transport of sediment.

- **Detrimental Displacement** - this has a negative effect of soil productivity and fisheries. Detrimentally displaced soil has an altered hydrographic function and often does not allow normal growth to occur. The A horizon usually has, in large, been removed and piled up. Displaced soils are often channelized and loosened so than they are more susceptible to erosion.

3.5.3.1.3.1.2 Overland Flow: Overland flow occurs when the infiltration rate or capacity of a soil has been exceeded by the amount of incoming precipitation or by the rate of snowmelt. Independent variables include all the soil and plant factors that influence infiltration rate, intensity and duration of precipitation, steepness of slope and whether or not the soil is frozen.

This factor becomes an issue when the magnitude of management induced overland flow increases over background levels. The amount of compaction, rutting, and displacement all can contribute to increases in overland flow.

3.5.3.1.3.2 Cumulative Effects on Water (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

The following list represents the anticipated cumulative, incremental effects resulting from the proposed actions as viewed in the context of the past, present and reasonably foreseeable future action on the Grassland:

- Possible short term increases in water and wind erosion.

- Increased overall production yielding more effective ground cover and greater ability for the site to generate/maintain effective ground cover.
- Increased overall production yielding more organic matter both in roots and in above ground biomass. The magnitude of net increase depends on stocking rates.

3.5.3.1.2.4 Fire Effects on Soils:

3.5.3.1.2.4.1 Direct Effects of Fire:

Fire destroys protective organic matter, volatilizes some elements, transforms elements to soluble forms, and alters the physical, chemical, and biological properties of soils. (Wells and others;1978) Until effective ground cover is re-established there is a short term hazard of additional erosion by wind and water. Some hydrophobicity may occur at sites with large accumulations of fuel such as in thick juniper stands, near large stumps and logs and under large piles. Fires usually create a flush of nutrients such as nitrogen, phosphorous and potassium. Some carbon is retained in the form of charcoal. This flush of nutrients provides nutrients to early successional species of grass, forbs and shrubs. It can also supply nutrients to noxious weeds and annual grass species. An appropriately competitive seed mix will help prevent weed and annual dominance. It is important to seed the first season with desireable species to out-compete existing weed species as soon as possible to avoid site dominance.

3.5.3.1.2.4.2 Indirect Effects of Fire:

Fire changes the surface soil microclimate. There is additional surface heating with more convection (ie dust devils) which results in a drier surface condition which is often more susceptible to wind and water erosion.

Shrubs provide the major source of water loss and carbon uptake in the intact sagebrush community. In the dry summer of 2001, shrubs had consistently greater water fluxes than either inter-shrub spaces or the post-fire community reflecting shrub access to deeper soil moisture reserves that are unavailable to the shallow rooted burn community. Productivity in the Great Basin may be reduced further as lower evapotranspiration from post-fire communties may increase runoff and nutrient losses. (Prater, M. R., Obrist, D., Arnone III, J. A., and DeLucia, E. H., 2002, Post-Fire Effects on Ecosystem Gas Exchange Patterns in Northern Great Basin Communities; DeLucia Lab- University of Illinois, unpublished.) In tact sagebrush plants are documented to provide surface water through hydraulic lift. Evidence suggests that this phenomenon occurs mainly at night and is driven by the water potential gradient existing between the upper and lower soil horizons (Richards and Caldwell,1987).

3.5.3.1.2.4.2 Differences between types of fuels treatments and effects to soils:

Standing live juniper does not burn well at live fuel moistures greater than 15 percent. Therefore, broadcast burning of standing juniper is normally conducted in the hot late summer or early fall. Normally, broadcast burning leaves a mosaic of burned and unburned conditions depending on wind, slope, and lighting pattern.

If juniper trees are felled and allowed to dry out, then burning operations can be conducted during higher moisture conditions. Understory fuel is still needed to carry the fire efficiently and effectively.

1. Of the possible treatments underburning (UB) is the least impacting on the soils resource. Burn severities are minimized due to the largely dispersed impacts of the burn itself. These types of burns most closely emulate natural processes relative to nutrient volatilization and nutrient dispersal.
2. Jackpot burning (JP) and Leave Tops Jackpot burning (LTJP) may or may not be any different than broadcast burning depending on fuel loadings and distribution. However,

under dry conditions heavier concentrations are burned at a greater intensity, but if burned under wetter conditions this method can be less impacting than broadcast burning.

3. Broadcast Burning (BC) can produce high intensity fires depending on fuel loading and distribution. If burned under drier prescriptions (which is normally the case for juniper burning where the target prescription is less than 15 percent live fuel moisture) then juniper will be killed throughout the stand. These types of fires may be similar to stand replacement types of fire intensities. Hydrophobic soil conditions can result from the cooked waxes and resins in the surface ash layer near large stumps or downed trunks.
4. Grapple Piling (GP) from existing trails and landings allows the net ground disturbance to be kept to a minimum. Pile locations can be adjusted to avoid leave trees. Horizontal fuel continuity can be interrupted so that potential rate of fire spread is reduced. Fire intensities will be higher under the piles but this effect will be concentrated near or on the already disturbed areas resulting in less net fire effect.

3.5.3.1.2.4.3 Cumulative Effects of Fire (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

Increased fire frequency has the potential to select for highly flammable annual vegetation such as cheatgrass and medusa-head. Prolonged fire suppression, on the other hand, has the potential to create higher burn severity conditions which can be more detrimental to site productiviy than more frequent lighter burns. This proposal establishes a goal regarding the desired seral structural conditions which will be more sustainable over time.

3.5.3.1.2.5 Tillage, Seeding and Fertilization:

These activities would help restore soil tilth and production through decompaction and fertilization. Potential soil productivity would be improved on depleted and eroded soils. Seedings in general are more productive, especially on depleted soils such as these (Rumsey, 1970).

There is a danger of weed competition from cheatgrass and medusahead in some areas. The decompaction and fertilization with 16-16-16-20 fertilizer will aid in making planted cultivars/species more competitive. This low nitrogen formulation will help in bunchgrass, forb, and brush colonization.

Tilling can increase the risk of delivered sediment to streams. Contour tillage and no-till buffers along stream channels can help reduce this risk. Fertilizer can be leached and washed into stream courses during the wet winter and early spring months which may contribute to stream eutrophication and subsequent algal blooms. This can be lessened by not directly applying fertilizer in or near stream courses.

Treatment levels depend on the presence of big sagebrush and bitterbrush stands and patches, which will be largely avoided with tillage and fertilizer treatments.

3.5.3.1.2.5.1 Direct Effects

Direct effects of tillage, seeding and fertilization include:

- Decompaction of compacted areas due to concentrated livestock and equipment impacts, increasing: infiltration, percolation, and soil water storage. Tillage will occur mostly on the contour.
- Mixing of organic matter.
- Burying and/or exposing weed seeds. This may be positive or negative depending on weed species.
- Restoration of site productivity to more natural levels especially on depleted soils. The recommended fertilizer formulation is a relatively low nitrogen formulation 16-16-16-20; NPKS with a recommended rate of 200 to 500 lbs/acre.

3.5.3.1.2.5.2 Indirect Effects:

Indirect effects of tillage, seeding and fertilization include:

- Possibility of increased short-term wind and water erosion depending on near future storm events and ground conditions.
- Increased available water capture and storage in soils due to roughness and permeability increase (fallow effects).
- Increased risk of delivered sediment to streams. Contour tillage and no-till buffers along stream channels can help reduce this risk.

3.5.3.1.2.5.3 Cumulative Effects (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

The following list represents the anticipated cumulative, incremental effects resulting from the proposed actions as viewed in the context of the past, present and reasonably foreseeable future action on the Grassland:

- Possible short term increases in water and wind erosion.
- Increased overall production yielding more effective ground cover and greater ability for the site to generate/maintain effective ground cover.
- Increased overall production yielding more organic matter both in roots and in above ground biomass. Net increase depends on stocking rates.

3.5.3.1.2.5.4 Soil Tillage Effects:

3.5.3.1.2.5.4.1 Direct Effects of tillage:

- Reduces bulk density and improves soil porosity.
    - This improves water and air movement to roots and soil flora and fauna.
- Increases numbers and distibution of mainly coarse pores.
    - This improves water, air movement for soil flora and improves mobility for soil fauna.
- Improves root growth conditions.
    - Reduces root penetration resistance, effective moisture depth and overall rooting depth.
- Disrupts macroaggregates.
    - Can destabilize soils in short term (first growing season).
    - One of the main reasons why contour tillage and discontinuous tillage are specified.
- Mixes and homogenizes soil and organic material.
    - This can have positive and negative effects. Long term tillage in the absence of organic matter additions has been shown to decrease soil organic matter. Short term forest tillage has not been shown to decrease organic matter. In the case of increased surface organic matter such as we have in much of our area due to fire suppression, the incorporation of organic matter is likely to keep it from being rapidly volitalized and mineralized in high severity fire situations (Cochran and Hopkins, 1991).
- Can invert topsoil-subsoil.
    - This can have both positive and negative effects. In relatively organic matter poor substrates such as many of our volcanic ash soils this can add to the overall long term nutrient reserves and cation exchange capacity (CEC).
- Provides seedbed for seedling establishment with reduced competition for seeded species.
- Can provide seedbed for noxious weeds including establishment of new populations and expansion of existing weed infestations.
    - This is always a concern when soils are disturbed and exposed. Seeding success depends to a large degree on the water year in which they are planted. As pointed out by Dr. Lee Eddleman from the University of Oregon success can be more

probable if the November and December precipitation is above "normal" (above average). Winter or spring planting (drilling) would be more successful under these conditions.

- Can provide short term nutrient pulse which may stimulate weed establishment and increase weed presence.
    - This is always a potential risk with any tillage and even more so with deeper tillage such as plowing with mold board plows (St. John, Ted, 1998).

3.5.3.1.2.5.4.2 Indirect Effects of tillage:

- Improves water infiltration, transmission and retention.
    - This improves conditions for roots and soil flora/fauna.
- Improves soil aeration and redox potential.
- Usually increased soil organic matter turnover (in agricultural fields with yearly tillage).
    - In wildland settings with limited tillage this has not been shown to be true.
- Changes soil stuctural stability (aggregation).
    - May result in short term susceptibility to wind and water erosion.
- Changes thermal conductivity and diffusivity.
    - Usually increases soil surface temperatures which is good for seed germination and plant establishment.
- Can change pH and other chemical properties (in field agriculture with regular tillage intensity).
    - Usually a longer term effect under regular tillage operations.

3.5.3.1.2.5.4.3 Cumulative Effects of tillage (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

- Increased rooting depth.
    - Allows plants to exhibit more vigor and subsequent productivity.
- Less overland flow (contour tillage).
    - Increases surface roughness, infiltration and percolation such that water is slowed and captured.
- Mixing of accumulated organic matter in soil profile (versus rapid oxidation in high severity wildfires).
    - Nutrient reserves are incorporated into the soil instead of being potentially lost due to volitalization and mineralization under fire conditions. In depleted soils this input is important to return to historic production potential.
- Higher potential site productivity with increased effective moisture, aeration and less root resistance.
    - Combined with fertilization of lower nitrogen fertilizer mixes such as 16-16-16-20 NPKS (Nitrogen, Phosphorous and Potassium along with Sulphur) this can help restore depleted soils.

3.5.3.1.2.5.5 Seeding Effects:

3.5.3.1.2.5.5.1 Direct Effects of Seeding:

- Provides desirable ground cover with a higher probability of establishment.
- Stabilizes soils in harsh environmental conditions especially where there are exposed subsoils, nutrient depleted soils, eroded soils and other altered settings.

3.5.3.1.2.5.5.2 Indirect Effects:

Seedings are often more productive than native rangeland, especially depleted rangeland or old agricultural land. They can and do provide an interim vegetative state which can build soil nutrients and desirable soil conditions.

3.5.3.1.2.5.6 Effects of Fertilization:

3.5.3.1.2.5.6.1 Direct Effects of Fertilization:

Fertilization generally increases the growth of plants and brush. In water limited systems such as the CRNG which largely has juniper woodland, juniper steppe and shrub steppe potential, results may vary widely depending on the timing and amount of precipitation. Nutrients such as elemental sulphur and phosphorous are limiting in this area.

Fertilizers come in many different forms and concentrations. For range and wildland use, especially where brush is being fertilized, the lower nitrogen formulations are recommended to avoid over stimulating the annual grasses and weeds, where present.

For local soils there is a chronic need for nitrogen, phosphorous and potassium along with sulphur.

3.5.3.1.2.5.6.2 Indirect Effects of Fertilization:

Fertilizer may affect mycorrhizal associations for grass and brush species. Under lower concentrations of primary nutrients and higher organic matter levels such as in a sagebrush stand there is an increased dependence on vesicular arbuscular mycorrhizae to obtain nutrients such as phosphorous. Inorganic fertilizers, especially superphosphate, should be used with care, since they can drastically inhibit vesicular arbuscular mycorrhizae (VAM) formation (Wicklow-Howard, 1994).

Research on the short grass steppe in Colorado indicates that available nitrogen (N) controls the rate and course of recovery. The addition of N slowed the rate of plant community succession at all of the previously cultivated sites in the study. Whereas, reducing N availabiliy increased the rate of succession and recovery of the sites towards productive rangelands. These effects appear to be relatively short lived (3 to 5 years) after cessation of fertilization (Klein, D.A., McLendon, T., Paschke, M. W. and Redent, E. F. 1996), (Paschke, M.W., McLendon, T., Klein, D. A and Redente; E. F. 1996). This was in a setting which was untilled and unseeded. With the proposed action which includes tillage and seeding we can take advantage of this N increase after tillage and low N fertilization by our desired seed mix which includes grass, legumes and forbs.

Plant Interactions in Regards to Nutrients: Legume species such as rangeland alfalfa, white and yellow sweet clovers, small burnet and sainfoin can be used to help restore soil productivity in this area. This will benefit both wildlife and livestock.

3.5.3.1.2.5.6.3 Cumulative Effects of Fertilization (refer to Appendix Y for a listing of ongoing and reasonably foreseeable future actions):

Fertilizers can improve the overall site productivity especially on previously heavily farmed and grazed soils. Overall plant vigor is better and the planted and/or existing desirable species are able to compete more successfully against weedy species. Fertilizer can be leached and washed into stream courses during the wet winter and early spring months which may contribute to stream eutrophication and subsequent algal blooms. This can be lessened by not directly applying fertilizer in or near stream courses.

3.5.3.2 Direct and Indirect Effects of Alternatives:

<u>3.5.3.2.1 Alternative A</u>

3.5.3.2.1.1 Juniper

Juniper density control is not prescribed under this alternative. Therefore juniper densities in the absence of fire would continue to increase across the Grassland. Juniper overstories result in

decreased ground cover. Understory vegetation which includes: grasses, forbs, and shrubs, are unable to successfully compete against western juniper for light, water, nutrients, or space. A lack of ground cover decreases water infiltration rates and increases the amount and rate of overland flow during storm events. This can result in increased erosion rates.

Current understory conditions will persist. Beneath juniper the understory would continue to be dominated by Sandberg's bluegrass and crested wheatgrass (if seeded in the past). If the site was not seeded in the past it would probably remain as a site characterized by Sandberg's bluegrass, annual grasses, and forbs. In other words the understory will probably remain suppressed and possibly continue to decline in ecological condition. The severity of these trends depends on site productivity and past disturbances.

Potential short term benefits from Alternative A would be less ground disturbance which would result in less potential for short term erosion.

This alternative (as compared to B, C, and D) would have the most impacts from high intensity wildfires and resultant high severity burns which have the potential to impact the soils resource by volatilizing and mineralizing nutrients**.** Long-term erosion potential would be greater with Alternative A due to greater potential for severe wildfires that would expose bare soil to the elements. Juniper control would not occur under this alternative. The risk of high burn severity fires will increase as juniper densities increase. As burn severity increases, the amount of nutrient volatilization, leaching, and erosion (wind and water) increases. Overall long term site productivity may be reduced.

Increasing juniper density on steep slopes could produce retrogressed soil surface and/or ground cover condition. This could lead to possible increased soil loss through erosion.

3.5.3.2.1.2 Seeded Sites

Some of the farmed/homestead sites (estimated at less than 10,000 acres of the 64,171 acres that have been seeded on the Grassland) have been depleted of soil nutrients and therefore potential production has been foregone. These altered sites do not respond as quickly to management or rehabilitation efforts. Time is needed to rebuild A-horizons and replenish soil nutrients. How long recovery could take is difficult to estimate. Many of the historically farmed sites are moving forward successionally (Grizzly Mountain area) while others are moving very slowly or possibly retrogressing (Boyce Allotment). (See Map 5 - Historical Vegetation Treatments--- the 1950s and 1960s treatments roughly approximates areas with the most concentrated homestead activities)

Arid systems recover slowly. It will take decades, possibly centuries for this ground to recover from the severe historic disturbances associated with the homesteading era.

Alternative A would forego more rapid recovery of areas that are depleted of soil nutrients (no acres of tillage, fertilization, or seeding).

Because this alternative does not propose any: juniper density control, tilling, seeding, or fertilization, it would limit the rate and extent of recovery to desired future plant species cover and composition. It would also limit the recovery of inherent soil productivity potential by not using decompaction techniques, fertilizer, or transitional plant species which would out-compete weedy species and improve soil fertility.

3.5.3.2.1.3 Grazing

This alternative would be the least impacting to the soil resource from potential cattle impacts with no acres grazed.

The current and historical amount and extent of microbiotic crusts is not known for the Grassland. They are observed throughout the Grassland on many different shaded and/or open substrates on both native and seeded sites (Adams and David pers. comm. 2004). In the absence of grazing, open growing and shaded crusts will possibly increase in their extent.

In the absence of grazing, fine fuels will accumulate providing additional fuel for wildfires. Therefore wildfire size could be expected to increase. This condition would allow for larger severe wildfires that would kill juniper. The effects to the understory would depend on pre-fire ecological conditions, slope, fire intensity, and weather during and following fires. In general, cover type changes would be from juniper woodland to grassland.

Grazing impacts such as seasonal compaction and nutrient shifts would not occur, resulting in a reduced potential for summer thunderstorm erosion and less depletion of upland nutrients.

There would be no mixing of surface litter via hoof action. This is generally a positive effect associated with livestock grazing that would be foregone under this alternative.

3.5.3.2.2 Alternative B

3.5.3.2.2.1 Juniper

Juniper density control is not prescribed under this alternative. Therefore juniper densities in the absence of fire would continue to increase across the Grassland. Juniper overstories result in decreased ground cover. Understory vegetation which includes: grasses, forbs, and shrubs, are unable to successfully compete against western juniper for light, water, nutrients, or space. A lack of ground cover decreases water infiltration rates and increases the amount and rate of overland flow during storm events. This can result in increased erosion rates.

Under this alternative, the use of prescribed fire to reduce fuel loadings and control juniper density would not be implemented. Therefore, the risk of large, high intensity, high severity fires would remain.

High intensity, high severity fires would likely reduce site productivity because of the volatilization and mineralization of nutrients that would occur. Other wildfire impacts may include localized soil seedbank removal, hydrophobicity (induced non-wetability of the soil surface), and the reduction of effective soil cover.

3.5.3.2.2.2 Seeded Sites

There was probably a net loss of soil productivity during the homesteading era due to farming and severe grazing. The rate of recovery from that period on the Grassland is probably retarded with livestock grazing. Ecological trends are generally upward on the Grassland but the rate of recovery is affected by grazing. Grazing would continue to modify upland vegetation at current rates. Grazing adapted species such as Sandberg's bluegrass would continue to persist in percentages higher than at historic levels. There would continue to be less horizontal fuel continuity between plants, shrubs, and trees. There would be no change in the rates of erosion on these sites due to grazing.

Restoration activities such as tilling and seeding are not proposed under this alternative and therefore the establishment of native vegetation would be limited and slow relative to Alternatives C and D. This would limit increases in organic matter input, litter layer development, and increases in soil nutrients and productivity on the proposed sites to be seeded under Alternatives C and D.

Potential productivity gains on previously farmed and seeded areas would be limited because decompaction and fertilization would not occur.

3.5.3.2.2.3 Grazing

Grazing would continue on 102,938 acres.

For a period during the late 1980s and early 1990s (approximately 10 years) re-grazing or double grazing occurred on the Grassland (this practice was terminated in 2000). This form of grazing acted to deplete soil nutrients over time (David and Adams pers. comm. 2003). Today grazing practices on the Grassland are conducive to continued upward ecological trends. As per current grazing practices on the Grassland (deferred rotation grazing and season long) in conjunction with monitoring standards prescribed by the Biological Assessment (USDI/USDA 2003) and GBGA/Grassland monitoring policy, sufficient organic material is presently remaining at the end of the grazing season to reverse past trends of depleting soil nutrients Today, a variety of stubble heights are left at the end of the grazing season, varying from 4 to 10 inches depending on the pasture and the opportunity for re-growth (refer to Grassland monitoring data kept at the Madras, Oregon office).

Grazing promotes nutrient cycling through rapid breakdown of organic matter into smaller particles in the system. Organic matter becomes more readily available for soil microorganisms such as soil bacteria and fungi. Microorganisms use the organic matter as an energy source and can release nutrients back into the soil for plant uptake. Thus, grazing may increase the rate at which nutrients cycle through an ecosystem. It may be argued that if nutrients are not bound up in soil or organic matter, then they are more vulnerable to being lost to the system (Krueger et al. 2002). Current grazing practices would not be as progressive or provide as rapid a rate of recovery as those proposed under Alternatives C and D which incorporate rest cycles into most of the grazing allotments. These rest cycles would allow for more soil binding of nutrients in the decomposition system. Grazing animal behavior influences the distribution of nutrients to various landscape positions. Animals may graze in one area and move to another area to rest or drink. Dung and urine may thus be more plentiful in the resting area and around a watering place than in the grazing area, a fact affecting the soil fertility of both areas, resulting in a net transfer of nutrients from the grazed area to the resting and watering areas. This may be important as nutrient movement is occurring over the pastures.

Biological soil crusts (also known as microbiotic crusts, cryptogrammic crusts, or cryptobiotic crusts) are an important part of the arid and semi-arid ecosystems of the intermountain west. Under Alternative B microbiotic crusts would continue to be disrupted from mechanical hoof action of livestock resulting in the risk of increased surface and rill erosion associated with wind and water.

Seasonal soil compaction resulting from grazing would continue. It can have an effect on infiltration (short lived compaction, especially on ashy sandy loam surfaces which are ameliorated through frost action each fall and winter) (David pers. comm. 2004).

Grazing may lower mychorrizal inoculum potential by disturbing the hyphal network and reducing the number of propagules of mychorrizal fungi. Where non-mychorrizal plant species dominate, such as disturbed sites in early stages of successional development, the success of these species may further reduce the number of mychorrizal fungi propagules. This reduction in mychorrizal fungi may slow plant succession (Wicklow-Howard, et al. 1994).

3.5.3.2.3 Alternatives C and D:

Table 3-20 (below) compares treatments and treatment acreages between Alternatives C and D.

Table 3-20 Alternatives C and D Comparison of Outputs

Vegetation Treatments/Grazing Disposition		Alt C	Alt D
Acres of Juniper Density Control - chainsaw		27,095	10,803
Acres of Juniper Density Control - chainsaw/prescribed fire		5,196	5,196
Acres of Sagebrush/Juniper cover control - prescribed fire		7,510	4,757
Acres of Sagebrush/Juniper cover control - mechanical		488	488
Acres of Juniper Control as part of seeding treatments - chainsaw		8,344	8,344
	Total Acres of Juniper Control	48,633	29,588
	Total Acres of Till/Seed/Fertilize	8,344	8,344
	Total Acres of Vegetation Treatment	48,633	29,588
Acres Open to Domestic Livestock Grazing		82,923	88,085
Acres Vacant to Domestic Livestock Grazing		0	1,592
Acres Closed to Domestic Livestock Grazing		8,233	13,261
Acres in Forage Reserve		11,782	0
Total Acres		**102,938**	**102,938**

3.5.3.2.3.1 Juniper

Fire intensity and severity would be reduced as fine fuels are consumed by livestock, thus limiting wildfire spread.

Removing juniper through cutting can improve forage production by a factor of nine and forage nitrogen by a factor of ten within two years of cutting (Bates et al., 1997). Competition for light water and nutrients is reduced when the juniper is removed. These resources (nutrients, water, and light) are then available for the understory. In addition, if the branches and leaves are lopped and scattered after the tree is felled nutrients tied up in the biomass of the tree are also made available. Cutting, lopping, and scattering would offset the lack of understory cover which would increase effective ground cover and reduce potential surface erosion over the ensuing five to ten years. These increases would be expected on 35,745 acres under Alternative C and 19,148 acres under Alternative D.

Mechanical juniper control methods (as proposed near Round Butte for a fuel break) would reduce mid-sized shrub canopies under both alternatives. Alternative C and D would treat 488 acres. Equipment use under these two alternatives would increase the risk of soil compaction and displacement. The degree of detrimental compaction and/or soil displacement associated with this treatment would not be expected to be measurable. The number of passes necessary to meet the treatment prescription would be two or less whereas detrimental impacts have been shown to occur after three or four passes or more. Some compaction and/or displacement would be expected, primarily where vehicles turned. Most if not all of the detrimental effects would be expected to be ameliorated by the year following treatment. With this proposed activity there could be some reduction in soil porosity resulting in reduced availability of nutrients, water, and air to plant roots. There could be some increased resistance to root growth. Mychorrizal symbiosis would also experience some reduction. These effects would be expected to be short term and alleviated by freeze-thaw and wetting-drying cycles over the following year.

No measurable increases in peak or overland flows would be expected. Vegetation would remain on-site; regrowth of herbaceous and shrubby vegetation would be expected within a year of treatment. This would help to capture and retain water and any sediment.

Prescribed fire, in conjunction with either chainsaw felling of juniper or mechanical treatment of decadent sagebrush, rabbitbrush, and juniper is proposed on approximately 12,706 acres under Alternative C and on approximately 9,953 acres under Alternative D. There would be a short-term risk of additional wind and water erosion associated with burning. Using low intensity spring/winter prescribed fires and creating a mosaic within the treatment area would minimize this risk. Only three units in Alternative C (Units 4, 22, 81 totaling approximately 1,243 acres) and two units in Alternative D (Units 4, 22 totaling approximately 881 acres) would have the entire unit treated, although a "treatment" is described as a mosaic of 50 percent burned versus 50 percent unburned. The risks would be greater on these units compared with units with a smaller percentage of the area treated but the differences between treatment areas is not considered to be measurable.

Creating a mosaic within each treatment unit would retain approximately 50 percent of the existing vegetation. This would hasten re-colonization of areas of fire killed (or otherwise removed) vegetation. This would further reduce the risk of additional wind and water erosion and provide native seed sources and vegetative material for re-colonization.

Fires (both wild and prescribed) usually create a flush of nutrients such as nitrogen, phosphorous and potassium. Some carbon is retained in the form of charcoal. This flush of nutrients provides nutrients to early successional species of grass, forbs, and shrubs. It can also supply nutrients to noxious weeds and annual grass species. Use of low intensity winter/spring prescribed fires while creating a mosaic of conditions both within treatment units and across the landscape would reduce the risk of infestation of noxious weeds and other invasives.

Fire (especially wildfire) changes the surface soil microclimate. Surface heating results in more convection (i.e. dust devils). A drier soil surface is often more susceptible to wind and water erosion. The potential for these effects would be reduced under both alternatives because the risk of wildfire would be reduced. Alternative C would provide the greatest reduction of wildfire risk due to the greater number of acres treated.

Fire may also further reduce productivity as lower evapotranspiration rates from post-fire communities may increase runoff and nutrient losses (Prater 2002). Shrubs provide the major source of water loss and carbon uptake in the intact sagebrush community. During the dry summer of 2001, shrubs displayed consistently greater water fluxes than either inter-shrub spaces or the post-fire community (Prater 2002). This reflects shrub access to deeper soil moisture reserves that are typically unavailable to the shallow rooted post-burn community. Intact sagebrush plants are documented to provide surface water through hydraulic lift. Evidence suggests that this phenomenon occurs mainly at night and is driven by the water potential gradient existing between the upper and lower soil horizons (Richards and Caldwell 1987). Because less water is supplied to surface soil horizons, the establishment of desirable perennial grasses may be affected. This would have a greater affect under Alternative C than Alternative D due to greater number of acres treated with prescribed fire.

Both alternatives proposed the piling and burning of slash on 2,171 acres (Units 47, 48). The proposed treatment area within each unit would total 1,629 acres or approximately 75 percent of the total unit area. These acres total approximate 16 percent of the acres to be treated by burning under Alternative C and approximately 21 percent of the acres under Alternative D.

Burning of piles allows: sensitive areas, residual vegetation, or other physical site attributes to be avoided and not damaged or destroyed. Horizontal fuel continuity can be interrupted so that

potential rate of fire spread is reduced. Fire intensities would be higher under the piles but would be concentrated under or immediately adjacent to the pile.

The remaining 83 percent of the proposed burn units under Alternative C (10,535 acres) and the 78 percent under Alternative D (7,782 acres) would be broadcast burned. Burn severities would be minimized due to the dispersed impacts of the burn due to dispersed associated fuel loadings.

Alternative C proposes to treat 7,510 acres and Alternative D proposes to treat 4,757 acres using prescribed fire without a pre-treatment. The primary objective of these burns is to add diversity to the mid-sized shrub canopy, in which the shrub canopy is continuous in the area where the burns are proposed. Occasional young juniper will be killed with these low intensity fires. These fires would produce a mosaic of treated and un-treated shrub islands, creating not only increased grass and forb acres but also biological diversity. These treatments would not be expected to have any negative effects to the soil resource as they are prescribed to be low intensity fires.

Under both alternatives, post treatment jackpot burning will be implemented on units where chainsaw felling or mechanical treatments result in concentrations of slash randomly distributed across the landscape. With this post treatment the heavier concentrations of slash would be burned leaving the remainder of the units unburned. A prescription which calls for burning under wetter conditions (reminiscent of winter/spring burns) would minimize: the risk of creating hydrophobic soils, the loss of nutrients through volatilization or leaching, and the risk or amount of wind and water erosion. This treatment would have no negative effects to the clay soils they are proposed upon. This treatment would not be effected by slope (steep slopes exist on less than 20 percent of the proposed treatment units). Piling and burning slash on clay soils would create a higher risk for the establishment of medusahead or cheatgrass if seed source were present (refer to Appendix T - Table of Shallow and/or Clay Soils with Higher Potential for Medusahead Grass Invasion).

3.5.3.2.3.2 Seeded Sites

Tillage has the potential to expose soils to water and wind erosion until the vegetation is re-established. However, tilling, seeding, and fertilization would also help restore site productivity through the amelioration of compaction and the introduction of nutrients. This would be accomplished on approximately 8,344 acres of seeded lands under both Alternative C and D. New seedings would generally be expected to be more productive than most native range as measured by the amount of biomass produced (Rumsey 1970). This effect occurs because: additional inputs of fertilizer increase biomass production, tillage reduces competition and creates a seedbed for seeded species, and re-seeded species may provide more tons of forage per acre for a time (5-20 years) (David pers. comm. 2004)

There is a low to moderate risk of weed competition from cheatgrass and medusahead in some areas due to the current presence of these species (Unit 44 near Buck Butte where medusahead exists). The proposed amelioration of compaction and fertilization with a 16-16-16-20 formulation of fertilizer would aid in making planted cultivars/species more competitive. Where fertilization will occur is yet to be determined. Such determinations will be based upon soil analysis and seeding trials conducted prior to project layout.

Fertilizer would help restore site productivity to better approximate historic levels, especially on depleted soils. Actual application rates to specific sites would be determined prior to application using appropriate soil analysis techniques (including seeding trials). This would allow applications to be applied to meet site-specific needs and avoid under or over application. All of the proposed sites to be tilled, seeded, and possibly fertilized are located on sites that were historically farmed. The levels of nutrient depletion on these sites is yet to be quantified but some depletion is suspected to exist.

Tilling and seeding would result in increased available water capture and storage in soils because of increased surface roughness and permeability.

Drill seeding is more ground disturbing than broadcast seeding but is much more cost effective, especially when expensive seed is being applied. The method of seeding to be utilized will be based upon seeding trials.

During the wet winter and early spring months, fertilizer can be leached and washed into stream courses which may contribute to stream eutrophication and subsequent algal blooms. As a risk reduction measure, the design criterion for seeding states to "Utilize protective buffers as specified in Inland Native Fish Strategy Environmental Assessment…" (Chapter 2, Section 2.5.7.1). All fertilizer would be applied by ground equipment, further limiting the risk of accidental application into live streams.

Under both alternatives, tilling, seeding, and fertilization would avoid big sagebrush and bitterbrush stands. This preserves pools of existing shrub species to maintain vesicular-arbusclar mycorrhizal fungi associations intact to help colonize adjoining areas as succession advances.

From one-third to three-quarters of each unit's acreage would actually be seeded. Some increases in peak and overland flows and increased rates of wind and water erosion would be expected, with the greatest increases expected in those units with a greater percent of the unit treated (tilled). These effects would be limited by the retention of between one-quarter and two-thirds of the existing vegetation within the unit. This vegetation would slow overland and peak flows, thereby, allowing water to infiltrate into the soil. Contour tilling and the increased roughness of the soil surface would also maximize the interception and retention of water and associated water borne sediment.

The risk of increased peak and overland flows and increased wind and water erosion would largely be eliminated once new vegetation becomes established (within one to three years of treatment).

Over the long term, tilling, seeding, and fertilizing would be expected to result in increased overall production (Rumsey 1970). This would result in sites having a greater ability to generate and maintain effective ground cover which translates into increased biomass production under Alternatives C and D.

3.5.3.2.3.3 Grazing

Alternative C would authorize grazing in 19 allotments, including approximately 82,923 acres of Grassland administered lands. Under Alternative D, grazing would be authorized on 20 allotments including approximately 88,085 acres of Grassland administered lands.

Under Alternative C grazing would be terminated on three allotments (Clevenger, Goldmine/Falls, and Peninsula) and one pasture (Squaw Creek in the Holmes-Squaw Creek Allotment) totaling approximately 8,223 acres of Grassland administered lands. This would reduce authorized animal unit months by 1,425. Alternative D would close approximately 13,261 acres, including the allotments and the pasture in Alternative C plus portions of the Lower Desert Allotment. Authorized animal unit months would be reduced by 731.

Under Alternative C, two forage reserves would be created from two existing allotments, Canadian Bench and Lower Desert, totaling approximately 11,782 acres of Grassland administered lands. No forage reserves would be created under Alternative D.

There are no established water sources or improvements on either of the proposed forage reserve allotments. On both allotments, the permittee would be required to haul water to temporary water

troughs. This would require the establishment of approximately 20 water sets under Alternative C. This would result in an increase in detrimentally impacted soils of approximately 20 acres associated with livestock congregating at the water sets. This would be a negligible increase in detrimentally impacted soils of less than 0.3 percent of the Grassland administered lands.

Under Alternative C, approximately 15 miles of fence would need to be constructed or reconstructed. Primary impacts are associated with the use of motorized vehicles ranging from OHVs to pickups to transport materials from roads to the site of the construction. Soil compaction and displacement would be limited to areas where vehicles were driven. Assuming a 10-foot wide "road," one mile of fence would result in approximately 1.2 acres of soil experiencing detrimental soil impacts. Approximately 15 miles of fence would increase the area of detrimentally impacted soils associated with fences by approximately 18 acres, from approximately 1,030 acres to approximately 1,048 acres. This would be approximately 1.3 percent of the Grassland managed lands in grazing allotments under each alternative, an increase of less than 0.1 percent.

Under Alternative D the Lower Desert Allotment would be reduced in size from 23,745 acres of mixed ownership lands to approximately 6,683 acres of Grassland administered lands. Grazing objectives include the enhancement of mule deer winter range browse quality. Effects of grazing would be similar to those described previously under Alternative B.

Under Alternative D approximately 11,711 acres of Grassland administered lands in the Lower Desert Allotment would be closed to grazing. No water pipelines or troughs would be required. No new fences would be constructed and no existing fences would be reconstructed in this area. There would be no measurable effects on soils.

Under Alternative D the Canadian Bench Allotment, approximately 1,592 acres of Grassland administered lands, would remain vacant. There would be no measurable effects on soils under this alternative.

Approximately two cattleguards in the Peninsula Allotment would be removed using a wheeled backhoe tractor. There would be no effects on soils. Cattleguards are located within already disturbed areas within the road prism. No undisturbed soils would be affected

Eliminating the re-graze option on all allotments except the Juniper Butte Allotment, and instituting rest in to the grazing system of eleven allotments would result in increasing soil surface organic matter. These measures would also enhance deep-rooted native perennial grass recruitment and increase the diversity of stubble height available for wildlife, especially birds. Rest would also aid the vigor of the existing plants by periodically providing a complete growing season for full development.

Continuing to graze allotments (Holmes-Williams and Steer) with versions of deferred grazing would result in surface organic matter continuing to be incorporated into the soil profile via hoof action. Surface litter accumulation would be less than under a rest rotation system resulting in reduced protection of the soil surface from raindrop impact and overland flow.

Retention of existing livestock numbers would have no measurable effects on soils over current conditions. Stubble height standards would affect the number of livestock and/or season of use. Livestock are to be moved when stubble height standards are met, potentially reducing soil impacts by automatically adjusting stocking rate based upon the years productivity and management. Effects to soils may not be measurable.

Realigning the Mud Springs Pasture boundary fence in the Fox Allotment would result in a few impacts (extent and duration) associated with grazing. Reduced livestock grazing associated

impacts would be realized with more real time control during the grazing season. This would mean a reduced potential for hoof action on the banks resulting in a reduced potential for bank erosion.

Construction of approximately two miles of new fence west of Mud Springs Creek Flat above the rimrock would establish better control of livestock use in that area resulting in an associated reduction of soils related impacts. Removal of approximately one half mile of existing fence by hand would have no measurable effect on the soil resource.

The difference in the effects of grazing on different soil types is not measurable. Livestock generally use steep slopes much less than flatter more gentle slopes, therefore, the effects from grazing are generally less profound on steep slopes (under current prescribed grazing practices).

3.5.3.3 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

3.5.3.3.1 Alternative A -No Action Alternative:

This alternative would be the least impacting to the soil resource from potential cattle impacts with 0 acres grazed. It would be have the most impacts from high intensity wildfires and resultant high severity burns which have the potential to impact the soils resource by volatilizing and mineralizing the most nutrients (0 acres of juniper stocking control). The no action alternative would forego a more rapid recovery of areas which are depleted of soil nutrients (0 acres of tillage, fertilization, and seeding).

3.5.3.3.1.1 Short Term Impacts:

Surface compaction would be reduced across the CRNG. No mixing of surface litter via hoof action. Class IV drainway banks would have less physical disturbance.

3.5.3.3.1.2 Long Term Impacts:

Seasonal infiltration would increase. Surface litter would increase, at least till the next wildfire. Wildfire intensity and fire severity would increase due to un-sustainable increases in juniper density. Soil productivity would not be improved.

3.5.3.3.2 Alternative B - Current Management:

This alternative would be third in its potential for impacts to soils. Grazing impacts would continue (102, 938 acres open). There would be no restoration activities such as tillage, fertilization, and seeding. This would slow the rate of recovery to desired vegetation conditions and potential productivity levels.

3.5.3.3.2.1 Short Term Impacts:

Seasonal soil compaction would still continue with its influence on infiltration (short lived compaction, especially on ashy sandy loam surfaces which are decompacted through frost action each fall and winter).

3.5.3.3.2.2 Long Term Impacts:

Wildfire intensity and fire severity would increase due to un-sustainable increases in juniper density. Soil productivity would not be improved.

3.5.3.3.3 Alternative C – Proposed Action:

This alternative would have the most potential for impacts to soils. Grazing impacts would continue on 82,923 open acres and 11,782 forage reserve acres for a total of 94,705 acres grazed. Closed acres would comprise 8,233 acres or 8 percent of the total 102,938 acres. There would be

48,633 acres of juniper density control, via chainsaws (27,095 acres), chainsaw, and prescribed fire (5,195 acres), prescribed fire (7,510) and mechanical (488 acres), with seeding treatments/chainsaw (8,344 acres). This has the potential to impact soils depending on the timing and specific methods used (see other comments on treatments in this section). In addition to juniper stocking control there are approximately 8,344 acres scheduled for tillage, fertilization and seeding. This alternative has the most potential to greatly restore and improve productivity on these depleted substrates (see comments on pipeline treatments and monitoring). There are more risks associated with potential weed problems in this alternative due to the number of acres of burning, mechanical fuels treatment, tillage, fertilization, and seeding.

3.5.3.3.3.1 Short Term Impacts:

Seasonal soil compaction would still continue with its influence on infiltration (short lived compaction, especially on ashy sandy loam surfaces which are decompacted through frost action each fall and winter). Juniper control projects, especially with fire, have the potential to expose more bare soil increasing susceptibility to water and wind erosion. Tillage has the potential to expose soils to water and wind erosion until the vegetation becomes re-established.

3.5.3.3.3.2 Long Term Impacts:

Fire intensity and severity will be lessened. Soil productivity will be enhanced through tillage, fertilizer and seeding. Ground cover will be enhanced with greater productivity.

3.5.3.3.4 Alternative D:

This alternative would be rated second in its potential for impacts to soils. Grazing impacts would continue on 88,085 acres. This is the third lowest number of acres grazed. This would have an additional 3,997 acres vacant to grazing. Acres closed to domestic livestock grazing would total 13,261 acres or 12.9 percent. Juniper stocking control via chainsaw would occur on 10,803 acres, via chainsaw/prescribed fire combination on 5,196 acres, via prescribed fire on 4,757 acres, and mechanical treatments on 488 acres (total juniper treatment acreage of 29,588) Tillage, fertilization and seeding would occur on 8,344 acres.

3.5.3.3.4.1 Short Term Impacts:

No grazing impacts on 14,853 acres which would reduce seasonal compaction. Fire intensity and severity would be reduced through stocking control. Some short term impacts may occur on the burned areas. Tillage would expose soil in the short term which may increase local wind and water erosion.

3.5.3.3.4.2 Long Term Impacts:

Fire intensity and severity will be lessened. Soil productivity will be enhanced through tillage, fertilizer and seeding. Ground cover will be enhanced with greater productivity.

3.5.3.4 Comparison Of Alternatives: (see comparison chart Table 2-6)

Other management actions such as the Grizzly Landscape Vegetation Project and proposed burns would help reduce the future fire intensity and severity in these areas under all alternatives. This would reduce oxidation and mineralization of nutrients in the long run. These actions would also help to reduce the size of areas burned.

The greatest reduction in oxidation and mineralization of nutrients would be associated with Alternative C because it has the greatest number and distribution of treated acres that reduce the quantity and distribution of fuels and fuel loadings across the landscape.

Alternative D, while treating approximately 16,000 acres, distributes those acres across the landscape and reduces the quantity and distribution of fuels in a way similar to Alternative C. It reduces the risk of high intensity and high severity fires but to a lesser degree than Alternative C but to a much greater degree than either Alternatives A or B.

Alternative A provides the least reduction of wildfire potential because no treatments would be implemented under this project and any reductions would be dependant upon the development and implementation of other projects such as the Grizzly Landscape Vegetation Project mentioned above.

Alternative B, because it continues grazing, provides a somewhat larger reduction in wildfire potential than Alternative A. Because it also depends primarily on the development and implementation of other projects, the decrease in intensity and severity of wildfires would not be measurably different than Alternative A.

Continued fire suppression in other areas may exacerbate the hazard of higher intensity fires. This would contribute to increased nutrient oxidation and mineralization that may reduce site productivity in the long run. The greatest risk is associated with Alternative A because the fewest acres are treated under the combination of this project and past, present and reasonably foreseeable future projects. Alternative B provides almost the same level of risk for the same reasons except that it continues grazing over the existing landscape contributing to at least some reductions in fuel buildup and fuel continuity. Alternative C followed by Alternative D (because they treat the most area) reduce the greatest number of acres susceptible to higher intensity fires and provide the greatest reduction of risk of wildfire.

Conversely, continued fire suppression, has the potential to create higher burn severity conditions that can be more detrimental to site productivity than more frequent lighter burns. Alternatives A and B, because they do no vegetation management, and because they are dependent upon other decisions to implement those types of activities, present the greatest risk of the high intensity fires and provide the greatest risk of damage to site productivity in both the short and long term. Alternatives C and D, coupled with other actions, reduce the risk of high intensity fires and limit the area subject to such events. This lowers the risk of damage to or loss of site productivity.

Other past, present, or reasonably foreseeable future actions have no identified or measurable effects on soils when combined with proposed actions under each alternative.

Table 3-21 LRMP Surface Soil Erosion Effective Ground Cover

Soil Resource Inventory Erosion Hazard Class	Minimum % Effective Ground cover – First Year	Minimum % Effective Ground cover – Second Year
Low	20-30	30-40
Moderate	30-40	40-50
Severe	50-60	60-75
Very Severe	60-75	75-90

3.5.4 Forest Plan Consistency

Table 3-22 features the LRMP standards and guidelines for soils and the alternative consistencies.

Table 3-22 LRMP Standard and Guideline Consistency for Soil Resource

Management Area	MA-G9 Riparian	MA-G5 Juniper Old-Growth	Scablands	Surface soil Erosion
Desired Condition	Maintain 90 percent of the area in an acceptably productive condition	Limit erosion rate that approximates natural processes. Soil compaction should not exceed limits that prevent plant establishment	Mitigate disturbance on scablands by dry season grazing and limited roading.	Land management activities will be planned to achieve effective ground cover as defined by the following classes: (Table 3-21)
Alternative A Consistency	Yes, no ground disturbing activities	Yes, no ground disturbing activities	Yes, no ground disturbing activities	Yes, no ground disturbing activities
Alternative B Consistency	Yes, no ground disturbing activities	Yes, no ground disturbing activities	Yes, no ground disturbing activities	Yes, no ground disturbing activities
Alternative C Consistency	Yes, no ground disturbing activities in riparian areas	Yes, no ground disturbing activities in designated juniper old growth areas	Yes, no ground disturbing activities planned in scablands	Yes, with juniper density control, ground cover will be sufficient to meet standards.
Alternative D Consistency	Yes, no ground disturbing activities in riparian areas	Yes, no ground disturbing activities in designated juniper old growth areas	Yes, no ground disturbing activities planned in scablands	Yes, with juniper density control, ground cover will be sufficient to meet standards.

3.6 Fisheries and Hydrology

3.6.1 Current Management Direction (LRMP, FSM, etc.)

The LRMP identifies goals, objectives, desired future conditions, and standards and guidelines for the fish and water resources.

3.6.1.1 Goals and Objectives

Provide, manage, and improve fish and wildlife habitats to maintain viable populations of existing native and desired non-native vertebrate species, including threatened, endangered, and sensitive species.

Maintain or improve water quality, quantity, and timing of run-off. Comply with the objectives of the Clean Water Act and Oregon State water quality standards.

The objective for water quality is that maintenance or improvement of water quality will be achieved through proper management of riparian areas and uplands.

3.6.1.2 Desired Future Conditions

In ten years, work to restore riparian areas will have been completed, but not all riparian areas will have had time to recover to full biological potential. Fish populations will increase dramatically as riparian areas improve in condition.

In fifty years and beyond, all riparian areas will be in excellent condition and fish populations will be ten or more times the present population due to excellent stream and riparian conditions.

3.6.1.3 Standards and Guidelines

<u>3.6.1.3.1 Grassland-wide standards and guidelines state:</u>

- Meet or exceed water quality standards for waters of the State through application of Best Management Practices (BMPs).
- Meet State standards for temperature, turbidity, and waste discharge.
- For those portions of Squaw Creek with existing temperatures at or above 58 degrees F, temperature will not be increased.
- For those portions of Squaw Creek with existing temperatures at or below 56 degrees F, the temperature may be raised a maximum of 2 degrees F.
- Cutbanks should not exceed on the average of 20 percent for any given stream drainage.
- Allow no more than 10 percent cumulative increase “in stream” turbidity.
- Retain at least 80 percent of the potential ground cover in grass-forb riparian communities. Also retain at least 80 percent of the potential tree or shrub cover in riparian areas dominated by trees or shrubs.
- Provide habitat for the rainbow trout by managing as required in the Riparian (MA-G9) Management Area prescription.

PACFISH and INFISH are Forest Plan amendments that provide standards and guidelines for activities on the Ochoco National Forest (including the Grassland) and their effects to inland and anadromous fish species and Riparian Habitat Conservation Areas (RHCAs). Refer to Appendix K for PACFISH and INFISH riparian management objectives and standards and guidelines specific to actions proposed in this FEIS. Appendix O identifies standard widths defining RHCAs.

3.6.2 Affected Environment

Lands managed by the Crooked River National Grassland (Grassland) are located in 10 watersheds: Willow Creek, Whychus, Mud Springs Creek, Deschutes South, Steelhead, Lake Billy Chinook, Crooked River Grasslands, Lower Crooked River Valley, Hay Creek, and Lower Metolius. Throughout central and eastern Oregon loss of beaver due to trapping in the early to mid 1800s eliminated periodic maintenance of beaver dams, which resulted in the subsequent loss of these dams that stored water and delayed runoff. This loss occurred within riparian areas on the Grassland such as Willow Creek and the Lower Crooked River.

Loss of beaver dams also likely decreased the zone of saturation within riparian zones and reduced the complexity of wet meadows. These reductions altered the lateral extent and composition of riparian vegetation. The losses of beaver dams may have also resulted in head cuts that subsequently would have caused channel down cutting/incision.

The introduction of large numbers of domestic livestock, both cattle and sheep, also started around the mid 1800s. Intense domestic livestock use resulted in the reduction of riparian vegetation that held stream banks together. On the Grassland this activity occurred specifically in Willow Creek, Mud Springs Creek, and Lone Pine Creek. This loss of riparian vegetation resulted in stream channel instability.

Implementation of fire suppression by settlers coupled with removal of historic use of fire by Native Americans, resulted in changes in vegetation including juniper expansion and the conversion of grasslands to juniper woodlands across the Grassland.

The expansion of juniper woodland and subsequent decline of historic shrub-steppe communities has increased the amount of bare soil. This has resulted in a higher potential for runoff and erosion on those juniper-dominated sites.

Removal of water from streams for crop irrigation started in approximately 1850 when the first water rights were established. This resulted in at least some streams being completely dewatered. On the Grassland this loss of water occurred primarily on Willow Creek.

Timber harvest and associated road and skid trail systems, initiated in the 1860s on Grizzly Mountain (most of which is not part of the Grassland): reduced the shade for streams, captured and concentrated flow (resulting in increases in peak stream flows), and reduced late season flows.

The collective effect of these historic activities (beaver trapping, grazing, fire suppression, irrigation, timber harvest, and roading) has produced much of today's hydrologic condition; reduced riparian plant composition and vigor, down cut and degraded stream channels, changes in upland vegetation, reduced stream flows and, in some cases, dewatered streams. Although many of the historic practices have been halted or modified to correct these problems, irrigation diversions continue to remove water from streams resulting in lower flows. Diversions in Willow Creek and Squaw Creek continue to remove all or some of the water in these streams resulting in reduced flows or even dry streams below the points of diversion.

Summer precipitation usually occurs in high intensity, short duration, and localized thunderstorms. Winter precipitation usually occurs as snow. Approximately twice as much precipitation occurs between October and March as occurs during the summer. However, precipitation levels are highly variable, both within and between years (Goodman 2004). Nearly all of the Grassland receives an average of less than 12 inches of precipitation per year.

Wide fluctuations in temperature and precipitation also result in wide fluctuations in stream flow (Goodman 2004). Willow Creek, Mud Springs Creek, Squaw (Whychus) Creek, and the Crooked

River are the only perennial systems. Most of the other drainages have only intermittent or ephemeral flow. There are some very short isolated segments of some intermittent streams that are perennial such as Mud Springs, Lone Pine Creek, Monnier Springs, and Lithgow Spring.
Water yield (runoff) for the area follows a general snowmelt runoff pattern with low flows through the summer, fall, and winter and peak flows in the spring (March or April).

Peak flows may be higher and base flows lower than those occurring prior to the mid 1800s due to the effects of past management and homesteading activities. These activities resulted in reduced vegetation and increased soil erosion. Reductions in the lateral extent and composition of riparian vegetation associated with the loss of beaver dams, the subsequent reduction in the zone of saturation, and the reduction in the area of wet meadows are also likely contributing to changes in both peak and base flows (Goodman 2004).

Base flows are also being affected by irrigation diversions that reduce historic low flow levels still further.

Increased tree densities and canopy closures are reducing water yield due to increased interception of both rain and snow and increased transpiration (Buckhouse 1999).

The reduction in riparian area vegetation associated with roads, stream channelizing during the 1950s and 1960s, farming and historic heavy grazing has resulted in streams becoming wider and shallower. This has resulted in increased soil erosion and sediment transport downstream. Streams are less stable, more incised, and have limited or no access to historic floodplains. High flows confine the stream energy to the incised channel resulting in additional soil erosion and sediment input. The reduction in riparian vegetation and subsequent increasing stream width allows increased solar radiation to reach the stream, resulting in an increase in stream temperature. This is true for Willow Creek, Lone Pine Creek, and Mud Springs Creek on the Grassland. These riparian areas have now been fenced from livestock use for the past 10 to 20 years, allowing various degrees of recovery. The Deschutes and the Lower Crooked Rivers are relatively intact today (Adams 2004). Irrigation diversions can reduce the low flows in summer, which allows the stream to heat up more than it would otherwise.

Sediment is also routed into streams from roads located so close to the streams that they lack adequate area for drainage structures to dissipate energy before water enters the stream. There are approximately 1,543 miles of roads located on all lands within the nine watersheds and subwatersheds in which the Grassland is located. Approximately 467 miles (934 acres) are Forest Service system roads located on Grassland lands, maintained by the Forest Service. The 819 miles (1,638 acres) of total road miles on Grassland administered lands are maintained by: the Forest Service, Jefferson County, and Oregon Dept. of Transportation. This is a 4.7 mi/sq mi density (USDA 2003, Table 45, page 122, 2003). Trail mileage (including hiker, horse, and Off Highway Vehicle (OHV)) totals approximately 55 miles (55 acres) (USDA 2003). This figure includes some overage to account for unmapped trails. Approximately 1.5 percent of Grassland lands are currently dedicated to roads and trails and not available for other resource activities. Logging roads were often adjacent to streams resulting in: altered channel meander, reduced effective floodplains, and routed sediment into the streams.

Today existing roads are providing the major negative influence to these stream systems as over 90 percent are fenced from livestock use and no farming or channelization is occurring.

Present ground cover conditions (rangeland health) on the uplands of the Grassland display a moderate to negligible/slight deviation from historic conditions (USDA 2001). Expanding juniper is reducing percent ground cover at this time. While riparian vegetation has returned to Willow Creek, Lone Pine Creek, and Mud Springs Creek, the systems are still lacking sinuosity and

acceptable stream channel depth to width rations. These systems are beginning to function but are at risk. As the riparian condition improves they would slow runoff from the uplands. Riparian vegetation provides for the following functions:

- Filters and blocks sediment from streams.
- Provides root mass to stabilize stream banks.
- Provides shade to cool streams in summer and keeps them from freezing solid during the winter.

The Deschutes River, Crooked River, and Willow Creek are generally entrenched in canyons with steep or vertical basalt cliffs creating a natural barrier to cattle. Gaps in fencing created to allow cattle access to water on the Grassland still exist rarely, but have been generally replaced by off-channel water sources (wells). Riparian areas without natural barriers to cattle access have been fenced within the last 20 years to protect riparian resources.

Table 3-23 (below) displays the total acres within each watershed and the number of Grassland public lands within each watershed.

Table 3-23 Acreages by Watershed, Crooked River National Grassland

Watershed	Total Watershed Acres	Acres Grassland Lands w/in Watershed
Crooked River Grasslands	55,942	14,397
Deschutes South	37,880	13,283
Hay Creek	23,159	700
Lake Billy Chinook	61,582	23,752
Lower Metolius	21,629	6,510
Lower Crooked River Valley	61,911	10,468
Mud Springs Creek	58,943	12,366
Squaw Creek (Whychus)	20,518	8,760
Steelhead	23,405	1,993
Willow Creek	82,653	29,103

The following table (Table 3-24) lists the watersheds, the total length of stream (in miles) by stream class within the Crooked River National Grassland Watershed analysis area. This area includes all of the watersheds that occur within the Grassland. These figures include all of the watersheds acreages including many acres outside of the Grassland. A Class 1 stream is perennial or intermittent flowing with a high density (number) of fish. Class 2 streams are perennial or have intermittent flows and a moderate number (or density) of fish, or provide high quality water for a Class 1 stream. A Class 3 stream has perennial flow and no fish. Class 4 streams display intermittent flows and no fish. Class 0 is used to designate stream segments for which there was no data available to classify the stream into one of the previous categories.

Most of the known springs on the Crooked River National Grassland are fenced from cattle. When new springs are discovered, these are also fenced to protect riparian resources. It is estimated that there are four springs remaining that need livestock exclusion fencing.

Table 3-24 Miles of Class 0-4 Stream within the Watersheds that Encompass the Grassland

Watershed (5th field)	Class of Stream	Miles of stream
Crooked River Grasslands	1	29
	4	109
Deschutes South	0	7
	1	3
	2	1
	3	1
	4	77
Hay Creek	4	2.5
Lake Billy Chinook	0	3
	1	12.35
	3	14
	4	57
Lower Crooked River Valley	0	0.7
	1	14
	3	4.9
	4	176
Lower Metolius	1	0.08
	4	45
Mud Springs Creek	2	40
	3	9
	4	136
Steelhead	1	10
	4	20
Whychus	0	2
	1	0.09
	4	34
Willow Creek	0	3.8
	2	21.5
	3	10
	4	176
Total Class 0	**0**	**16.5**
Total Class 1	**1**	**68.52**
Total Class 2	**2**	**62.5**
Total Class 3	**3**	**38.9**
Total Class 4	**4**	**830**
Total All Streams		**1,016.42**

There are eight listed (ESA and Regional Forester Sensitive) aquatic species that occur on the Ochoco National Forest. Two are listed threatened: bull trout listed by the U.S. Fish and Wildlife Service (USFWS) and Mid-Columbia River steelhead trout listed by the National Oceanic and Atmospheric Administration (NOAA); five are listed sensitive by Region 6 Regional Forester: redband trout, Mid-Columbia River spring-run chinook salmon, Malheur mottled sculpin, Columbia spotted frog, and westslope cutthroat trout. In addition, the Forest Service is required by the Pacific Fishery Management Council to determine impacts of projects to Mid-Columbia River spring-run Chinook essential fish habitat (EFH).

Bull trout, redband trout, and Columbia spotted frog inhabit streams on the Grassland. Historically, Mid-Columbia spring-run chinook salmon and Mid-Columbia River steelhead trout may have utilized streams on the Grassland in higher water years before passage was restricted by the Pelton Round Butte Dam Complex. Historical documentation is not available to suggest consistent historic use for spawning or adult holding habitat (Lichatowich 1998).

This analysis includes discussions of the following species - bull trout, redband trout, and Columbia spotted frog; and the habitats for the following species - Mid-Columbia River steelhead trout, Mid-Columbia River spring-run chinook salmon and Mid-Columbia River spring-run chinook salmon EFH. Steelhead trout and chinook salmon could inhabit portions of the Grassland upon completion of proposed fish passage improvements associated with the current Federal Energy Relicensing Commission's (FERC) relicensing process for the Pelton and Round Butte Dams. These improvements could be in place within the next decade. Complete discussions of these individual species are found in the Potential, Endangered, Threatened, and Sensitive Species (PETS) Section 3.8.2 later in this document.

Westslope cutthroat trout and Malheur mottled sculpin do not occur in the streams on the Grassland nor is there habitat present. These species will not be discussed further.

3.6.2.1 Willow Creek Watershed

Willow Creek Watershed encompasses 82,653 acres of juniper-pine-shrub, juniper-shrub, shrub vegetative type, and agricultural lands on the Deschutes-Columbia Plateau of Central Oregon. It encompasses eight entire allotments and one pasture of an additional allotment within the Grassland.

Following settlement of the area in the 1880s, Willow Creek and its tributaries were subjected to extensive dryland farming, grazing pressure and water withdrawal for irrigation.

Physical and biological habitat surveys conducted in 1979 showed Willow Creek to have been in fair to very poor condition. Channel segments administered by the Grassland were generally in better condition than those on private land (ODFW 1979). Willow Creek, on the Grassland, has been protected from cattle grazing for approximately 20 years in an effort to improve riparian vegetation. Riparian areas appear to be in an upward trend. There are no current riparian surveys available for confirmation.

Willow Creek and its tributary, Rimrock Springs Creek, are the only perennial fish bearing creeks within the watershed. Fencing or geographic barriers, such as basalt cliffs, protect Willow Creek and Rimrock Springs Creek. Portions of five allotments border Willow Creek including: Dump, Fox, Blanchard, Grizzly, and Steer.

Willow Creek, from the mouth to McMean Springs on the Grassland, is on the State of Oregon water quality impaired streams list (303d listed) for high stream temperatures during summer flows (ODEQ 1998). Temperatures exceed the 7-day average of daily maximum 55 days exceeding standard (64 degrees) (ODEQ 1995). Downstream, the Bureau of Land Management (BLM) data indicate temperature exceeding the 7-day average of daily maximum 115 days exceeding standard (64 degrees) (ODEQ 1994).

Willow Creek is on the State of Oregon 303d list for water temperature.

Watershed Morphology and Water Quality

The middle portion of Willow Creek, within the Grassland, is generally incised within a canyon and surrounded by near vertical basalt cliffs.

Stream channels within the allotments in this watershed are typically low gradient, ephemeral, intermittent draws draining upland juniper steppe environments. Precipitation averages 9 to 16 inches annually.

Fine/loamy and ashy soils (David 2003) are sensitive to disturbance when protective ground cover is removed.

Historically, intensive grazing and farming in uplands and intermittent drainages initiated a period of entrenchment (i.e. down cutting). Overgrazing has ceased on the Grassland, but the processes of erosion and deposition within upland swales continue as stream channels seek a relative balance between past erosion and deposition.

Inventory of stream channel morphologic trend in ephemeral and intermittent channels is not available for the Grassland.

A range ecological site inventory conducted in 2001 by the Natural Resource Conservation Service (USDA 2001) found upland vegetative trend stable or moving toward climax vegetative species. Given an improved upland vegetative condition in the allotments in the Willow Creek Watershed, geomorphic trends should see improvement, although geomorphic stability would lag behind vegetative recovery.

Intensive grazing and farming have ended in the Grassland portion of the Willow Creek Watershed. There has been a substantial increase in off-road vehicle use.

3.6.2.2 Whychus Watershed

Whychus Watershed encompasses 20,518 acres of juniper-pine-shrub, juniper-shrub, and shrub vegetative types. The entire Whychus Creek Watershed extends from its confluence with the Deschutes River, upstream through Sisters, Oregon, into the Cascade Mountains. The Sisters Ranger District, Deschutes National Forest, assessed the entire 177,834 acres of the Whychus Watershed in 1998 (Note: The name Whychus has not been accepted as the official place name for Squaw Creek. In this document, Squaw Creek is used when referring to the creek and Whychus would be used when referring to the Watershed within the Grassland).

Whychus Watershed contains 8,760 acres of the Holmes/Squaw Creek, Lower Desert, and Williams Allotments.

Allotment guidelines, natural barriers, and corridor fencing protect Squaw Creek from domestic livestock grazing.

Historically, horses, sheep, and cattle grazed the Squaw Creek pasture. Sheep have not grazed the Squaw Creek pasture for four years. The pasture is administratively closed to cattle to protect riparian resources and bull trout.

Whychus Watershed encompasses approximately 18 miles of Class 1 (perennial flow streams with spawning habitat) streams and 34 miles of Class 4 intermittent streams. Lower Squaw Creek within the Grassland has a high biological importance because of its excellent redband spawning habitat, scenic qualities, and recreational fishing opportunities. Bull trout from the Metolius population are known to inhabit lower Squaw Creek, near Alder Springs, for at least some of their life history.

Squaw Creek above Alder Springs is on the State of Oregon's water quality impaired streams list (303d listed) from River Mile 0-1.6 for temperature from September 1 to June 30 for spawning and

from River Mile 1.6-21 for temperature for rearing (ODEQ 2002). The water temperature exceeds the 7-day maximum floating average by exceeding 64 degrees for 76 days with 9 of those days during the spawning period.

Morphology and Water Quality

Stream channel morphology has probably changed very little on the Grassland from pre-European settlement, except in the uppermost portion of the watershed where the C-type channels have been degraded (USDA 1998).

Sediment transport to the Whychus Watershed is probably greater than it was prior to 1850. Channel straightening and simplification of floodplains upstream from the Grassland have increased the quantity of suspended fine sediment and bed load transported to Squaw Creek within the Whychus Watershed (USDA 1998).

The morphologic characteristics of Squaw Creek in the first 12 miles from its confluence with the Deschutes River are characterized as naturally deeply incised and confined within a canyon of vertical basalt cliffs. The canyon changes to a trough shaped valley with steep to moderate side slopes upstream. Fifteen miles from the confluence the river valley becomes relatively unconfined.

Water development and withdrawal began in 1871, being the first such development in the Deschutes Basin. In 1895, the Squaw Creek Irrigation District built a canal, dewatering Squaw Creek near Sisters, Oregon. By 1912, summer flow near Sisters, Oregon had been entirely diverted for irrigation (Nehlsen, 1995). The diversion of water continues today and was an early reason given for the decline of anadromous salmonids before the construction of Pelton Dam (Lichatowich 1998).

Substantial regional groundwater input augments surface flows. At Alder Springs, on the Grassland, water quantity and quality improve markedly.

Alder Springs provides 5 to 6 cubic feet per second (cfs) flow into Squaw Creek. Water temperatures were at 52 degrees (F) during 2001, 2002, and 2003. This additional water helped to decrease water temperatures in Squaw Creek and improve conditions for aquatic species requiring water temperatures below 64 degrees F.

Stream survey data collected in 1997 indicate pool depths increase downstream from Camp Polk because of augmentation by frequent large springs. Springs increase the depth of the stream, thereby increasing the depths of the pools. The frequency of pools decreases downstream from Camp Polk, but the depth of pools increases substantially (USDA/USDI 1997). Increasing the depth of the stream increases the size of the pools and at the same time decreases the numbers of pools. Greater water volume decreases stream temperatures and increases the amount of cover for fish. Deep complex pools and perennial cool water create excellent habitat for aquatic species. Water temperatures below 64 degrees meet the goals of INFISH and PACFISH.

Water samples taken in the upper reach of Whychus Watershed observed dissolved oxygen levels below state standards in April and August 1999. The samples were at 90 to 95 percent of the saturation standard for that elevation and temperature (USDA 1998).

Squaw Creek is on 303d list for water temperature for rearing and spawning.

3.6.2.3 Mud Springs Creek Watershed

The Mud Springs Creek Watershed encompasses 58,943 acres of juniper-pine-shrub, juniper-shrub, and shrub vegetative types including approximately 12,355 acres of Grassland managed lands. All are in the Fox and North Allotments.

The segment of Mud Springs Creek bordering the two allotments is a Class 2 fish-bearing stream. It becomes isolated from middle and lower Mud Springs Creek during summer low flows due to low flows and irrigation withdrawals on private lands.

The Mud Springs Creek Watershed is tributary to Trout Creek, a significant contributor to steelhead trout production in the Deschutes River Basin.

Watershed Morphology and Water Quality

Much of Mud Springs Creek was probably an E-type channel based on its lack of confinement, gradient and relict meander pattern as interpreted from aerial photos, images, and field visits. Riparian sedges, grasses, and shrubs would have been important in maintaining channel integrity in this system.

Lower Mud Springs Creek flows through agricultural lands where it has been channelized to meet the needs of agriculture. Most of the land surrounding the lower Mud Springs Creek Watershed is comprised of irrigation pivots. The course of the creek has been altered to follow private land boundaries. No historic channel patterns could be determined from aerial imagery because of the extremely degraded channel conditions.

The character of Mud Springs Creek is less altered by equipment but is degraded due to entrenchment at the upstream Grassland boundary. From the boundary south, (approximately three miles) Mud Springs Creek on the Grassland is listed as a Class 2 perennial fish-bearing stream. The channel type is a G5 or F5 (unstable channels) depending on the amount of floodplain development within the entrenched channel.

Adjacent to the Fox and North Allotments, Mud Springs Creek probably began to entrench and erode because of heavy grazing pressure on riparian and upland vegetation as well as farming by homesteaders and subsequent soil loss from erosion. This pressure set off a sequence of geomorphic changes resulting in the entrenchment seen today.

Degradation of vegetation and soils during the homestead era throughout the watershed caused changes in watershed hydrology. Peak flows and erosion increased. The creek became straighter and steeper to accommodate increased water and sediment loads.

Concurrent with upland conditions being de-graded, key vegetative components for maintaining stream channel integrity were being eaten or trampled by ungulates (livestock and wildlife). Loss of riparian vegetation allowed acceleration of channel entrenchment, slope increase, and straightening.

Today, a gully system exists where there was once meadow habitat. Mud Springs Creek (wherever live water exists) has been fenced from livestock use for approximately the past 10-15 years.

Sediment transport from uplands and riparian bottoms have contributed to the current condition of Mud Springs Creek. Past overgrazing and uncontrolled off road vehicle use has also contributed to the current state of Mud Springs Creek.

3.6.2.4 Deschutes South Watershed

The Deschutes South Watershed is located in semi-arid juniper-steppe or shrub-steppe. It encompasses approximately 37,880 acres, including approximately 11,944 acres managed by the Grassland in six allotments. It includes lands surrounding Lake Simtustus and Dry Canyon, an intermittent tributary of Willow Creek.

The Deschutes South Watershed contains approximately ten miles of perennial streams including the Lake Simtustus reach of the Deschutes River. It also contains approximately 77 miles of Class 4 intermittent streams.

The six allotments within the watershed contain no fish-bearing perennial streams (Class 3) but do contain discontinuous segments of perennial non-fish bearing stream channels. Most Class 3 streams (perennial non-fish bearing) are fenced or have natural barriers preventing access by livestock.

The Round Butte Allotment borders a canyon that drains flat shrub-steppe terrain in the Dry Canyon Watershed. Water within this short canyon is believed to be primarily irrigation return flow from private agricultural fields. This unnamed intermittent creek drops off a steep falls near its mouth, directly into Lake Billy Chinook. Geomorphic and vegetative trends in this creek are unknown. Round Butte Allotment is fenced.

The Juniper Butte Allotment borders a Class 2 stream flowing into Haystack Reservoir and is fenced. Surveys have not been conducted on this unnamed tributary to Haystack Reservoir. The tributary is considered a Class 2 stream because fish from the reservoir can migrate upstream and the tributary is likely to be occupied with fish.

Watershed Morphology and Water Quality

Dry Canyon Creek is the main drainage within this watershed. It is confined within a steep, V-shaped canyon. Bedrock and colluvial boulders of volcanic origin structurally control the creek.

3.6.2.5 Steelhead Watershed

The Steelhead Watershed encompasses 23,405 acres along the middle Deschutes River. It includes approximately 1,993 acres managed by the Grassland.

The Deschutes River is deeply entrenched into a canyon surrounded by nearly vertical basalt capped cliffs.

The middle Deschutes River is a designated Federal Wild and Scenic River and co-managed by the Bureau of Land Management and the Grassland.

The Goldmine/Falls and Clevenger Allotments intersect approximately 3,600 feet of the middle Deschutes River canyon. Both allotments have natural cliff barriers that prevent livestock from accessing the river and have been in non-use status for about ten years.

Watershed Morphology and Water Quality

The morphologic characteristics of the watershed between Squaw Creek confluence and River Mile (RM) 25 have likely changed very little over the last 150 years or more (Grant 1999). The river is structurally controlled and deeply entrenched into a basalt rock canyon. This segment of the Deschutes River has deep pools, often in excess of eight feet.

Because of the confined nature of the river and the large volume of discharge throughout the year, riffle habitats are also quite deep.

The Deschutes River has a stable flow regime, relative to the Crooked River, creating conditions for limited streambed scour except during large hydrologic events (Grant, 1999). Gravels derived from the watershed are typically maintained in the canyon, creating stable gravel deposits at pool tail outs (Grover 2003).

Riparian vegetation is limited to a thin green line at the base of colluvial talus slopes. Historically, riparian trees and shrubs had limited areas to grow within the canyon.

Nehlsen describes this reach as having excellent spawning potential because of the gravels found directly downstream of pools (Nehlsen 1995).

Sediment supply to the watershed has probably increased from pre-settlement levels (before 1850) because of the growth of towns, road construction, logging, grazing, and farming. Increasing recreational use in the middle Deschutes canyon has contributed to existing erosion because of unregulated trail use along the Deschutes River.

The summer flow regime through this reach has changed in modern times because of irrigation withdrawals upstream and outside of the analysis area. Much of the surface flow is diverted for irrigation before it reaches the canyon, leaving spring inputs as the source of water for the reach during the summer.

3.6.2.6 Lake Billy Chinook Watershed

The watershed area covers approximately 61,582 acres, including approximately 22,414 acres managed by the Grassland.

This watershed is comprised of four sub-watersheds with intermittent drainages generally flowing from southwest to northeast into the Deschutes River. They are in semi-arid areas on the east flank of the Cascades foothills, north of Sisters, Oregon, and south of the Metolius Arm of Lake Billy Chinook.

There are 73 miles of mapped streams in the watershed. Fifty-seven miles of the mapped streams are Class 4 intermittent. The remaining streams in the watershed are either unclassified or they encompass the Deschutes River and the Deschutes Arm of Lake Billy Chinook (less than 1 mile of Class 1 streams).

Morphology and Water Quality

The portion of the Lake Billy Chinook reach of the Deschutes River, upstream of the reservoir influence, is similar to the Deschutes River in the Steelhead Watershed. Lake Billy Chinook inundates approximately 8.7 miles of the Deschutes and Crooked Rivers in the Lake Billy Chinook Deschutes Watershed. The character of the Deschutes River changes at this point from a flowing river to a lake environment.

3.6.2.7 Crooked River Grassland Watershed

The Crooked River Grassland Watershed is 55,942 acres in size, including approximately 13,803 acres managed by the Grassland.

Much of this watershed is in a semi-arid climate of juniper-pine-shrub, juniper-shrub, and shrub vegetative types. The lower Crooked River flows through the watershed and is approximately 30 miles in length of which approximately 15 miles flows through the Grassland.

Riparian areas in the watershed are primarily Class 4 streams draining off steep canyon rims directly into the Crooked River. There are also springs and Class 3 riparian areas comprising about 160 acres. Most Class 3 streams and springs are fenced in these allotments. Class 4 streams are not fenced.

Lithgow Creek, bordering the Cyrus Allotment, flows onto a shrub flat north of Gray Butte and disappears before reaching Forest Road (FR) 9600. Perennially flowing segments of Lithgow Creek are underlain by bedrock. This creek is predominantly over five percent in gradient.

Lithgow Creek is fenced and is believed to be in an upward geomorphic and vegetative trend, based on limited site inspection.

The Crooked River is on the 303d list for pH, fecal coliform, and temperature.

Watershed Morphology and Water Quality

Lake Billy Chinook extends up the Crooked River approximately six miles from its confluence with the Deschutes River.

The Crooked River is on the 303d list for pH, fecal coliform, and temperature (rearing 64 degrees F during the summer) during the summer from RM 1 to RM 51 and for pH winter, spring, and fall. Redband trout populations are fragmented and depressed in part due to low flows caused by stream diversions. Temperature exceeded the 7-day average of daily maximum with 37 days exceeding the standard (64 degrees F) (ODEQ 1998).

From RM 6 to approximately RM 25 (the Crooked River Grasslands reach), large deep pools, cascading deep riffles, and limited spawning gravel characterize the Crooked River.

Peak spring flow from the Crooked River Basin upstream of this reach has been reduced from historic levels because of the installation of the Bowman and Ochoco Dams. The high variability in flows from spring to summer has decreased but summer base flows are less than they once were (Lichatowich 1998).

A series of productive springs from RM 18 to Lake Billy Chinook delivers an estimated 1,006 cfs of groundwater to the Crooked River through this reach (USGS 2001). Low surface flows during the summer, resulting from irrigation withdrawal and summer drought, are supplemented by this large influx of groundwater throughout the Crooked River.

High summer stream temperatures resulting from low flows are reduced by the groundwater input. Springs average approximately 55 degrees F, and late season surface water in the Crooked River was measured at 55 degrees F during a stream survey in 1991 (USDA 1991b). Lower water temperatures within this reach improve water quality for salmonids during summer drought.

3.6.2.8 Lower Crooked River Valley Watershed

The Lower Crooked River Valley Watershed encompasses 61,911 acres within a semi arid climate of juniper-pine-shrub, juniper-shrub, and agricultural lands. It includes approximately 10,198 acres of land managed by the Grassland.

There are 176 miles of Class 4 intermittent streams and approximately 14 miles of the Crooked River (Class 1) within the watershed. There are also approximately 4.7 miles of perennial non-fish bearing streams, primarily in Lone Pine Creek and Skull Hollow Creek, within the watershed boundaries on Grassland. There are approximately 3.8 miles of Class 3 and approximately 51 miles of Class 4 streams within the Lone Pine and Skull Hollow drainages. Approximately half of these miles of Lone Pine Creek and all of Skull Hollow Creek are within the Crooked River National Grassland boundary.

Perennial segments of Lone Pine Creek and Skull Hollow Creek initiate from springs on the Grassland and often flow on the surface for hundreds of feet before going subsurface.

Skull Hollow Creek becomes intermittent before flowing onto a valley flat at the mouth of Skull Hollow Creek. Due to the lack of a channel, it flows overland and does not connect with the Crooked River. It is located entirely on the Grassland.

Lone Pine Creek flows south into irrigation canals off forest. It no longer has a natural confluence with the Crooked River. This riparian area has been fenced from livestock use for approximately 15 years.

Both Skull Hollow and Lone Pine Creeks are entrenched with short segments of perennial flow during the summer. On the Grassland, spring areas are fenced, well vegetated, and in an upward vegetative trend (USDA 2001).

Watershed Morphology and Water Quality

Lone Pine Creek and Skull Hollow Creek flow from the north, off of Grizzly Butte toward (but do not reach) the Crooked River. Approximately half of Lone Pine Creek is on private land while all of Skull Hollow Creek is on the Crooked River National Grassland. These drainages produce limited flow that, once off the Grassland, is diverted into canals and used for irrigation.

3.6.2.9 Lower Lake Billy Chinook Watershed

The Lower Lake Billy Chinook Metolius Watershed encompasses 21,629 acres on the Grassland. The Metolius River forms a major river confluence with the Deschutes River in this watershed (less than one mile of Class 1 stream).

Watershed Morphology and Water Quality

The Metolius River forms a major river confluence with the Deschutes River in this watershed. The area within this watershed is largely rangeland breaking at steep basalt cliffs overlooking the river.

Immediately upstream of its confluence with the Deschutes, the Metolius River becomes steeper prior to inundation by Lake Billy Chinook.

The Metolius River originates from robust groundwater output (estimated 724 cubic feet per second) along its course, resulting in low annual variation in flow (USGS 2001 and Grant 1999). Sediment transport in the river has historically been low. This is supported by cross-section surveys of delta sediments at the mouth of the Crooked, Deschutes, and Metolius Rivers where these rivers meet Lake Billy Chinook (Grant 1999).

3.6.2.10 Hay Creek Watershed

The Kennedy Allotment within the Hay Creek Watershed contains no perennial streams and 2.5 miles of RHCA associated with intermittent streams.

3.6.3 Environmental Effects

3.6.3.1 Direct Effects & Indirect Effects

All alternatives are designed to meet INFISH (USDA, 1995) and PACFISH (USDA, 1994) Riparian Management Objectives (RMOs) (Appendix K) and to follow the Standards and Guidelines for Timber Management, Grazing Management, and Fire/Fuels Management (LRMP 1989). Specifically these standards provide grazing monitoring standards such as end of season stubble height standards. The alternatives also follow the Project Design Criteria as stated in the Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands within the Deschutes Basin Administered by the Bureau of Land Management Prineville Office and the Deschutes and Ochoco National Forests 2003-2005 (BA) (Appendix N). Refer to Chapter 3, Section 3.8 for an explanation of the BA.

The Oregon Department of Environmental Quality's (ODEQ) target date for completion of Total Maximum Daily Loads (TMDLs) and Water Quality Management Plans (WQMPs) in the area

encompassing the Crooked River National Grassland is 2006. The Forest Service is participating in this process and will continue to work collaboratively with watershed councils and the ODEQ to develop WQMPs. Therefore, no separate WQMP will be prepared in association with this FEIS. The 303(d) listed streams on the Grassland are not expected to be measurably affected by the management actions proposed in the four alternatives. No treatments would occur in designated Riparian Habitat Conservation Areas and almost all (over 90 percent) of the riparian areas on the Grassland have been fenced to exclude livestock grazing.

There would be no measurable effect on water quality under any of the proposed alternatives.

3.6.3.1.1 Alternative A – No Grazing

Under Alternative A, vegetative conditions within the Rush and Boyce Allotments (approximately 12,000 acres) which contain the majority of the historically homesteaded, farmed, and seeded land would remain at increased erosion and run-off risk and in a stagnant ecological condition for the next 100 years. Many of these sites have bare soil or inadequate ground cover (vegetation, litter, and coarse materials) needed to control or limit surface runoff and erosion. The lack of ground cover could result in increased surface runoff and erosion compared to sites where adequate or good ground cover exists.

Juniper has expanded its range, distribution, and density beyond its historic range of variability. Failure to treat juniper would allow further juniper expansion. Indirect effects include potential loss of grass/shrub under story as juniper canopy increases because of lack of treatment. Grass/shrub under story filters sediment, reducing the amount of sedimentation that enters streams. A reduction in the grass/shrub under story would provide a chronic sediment source downstream from the uplands.

It is unknown whether loss of groundwater flow due to expansion of juniper can reduce stream flows to a measurable level in fish bearing streams. Changes would more likely to be associated with climatic wet/dry cycles which would be more likely to result in measurable increases or decreases in surface and groundwater flows and in the size of wet meadows. Belsky (1996) notes that most observations of reduction in flow from springs are anecdotal and further study is necessary. Long-term anecdotal evidence from range specialists on the Grassland suggest there have been localized increases of flow from springs that have had juniper removed (Adams 2003).

Since the effect of juniper on surface and groundwater flows is not clearly established, the indirect effect of juniper expansion within all Grassland watersheds may contribute to localized reduction of water contributing to seeps and small springs. The groundwater flows contributing to Squaw Creek within the Holmes-Squaw Creek Allotment are large and regional in source area. Aquatic resources in Squaw Creek are unlikely to be affected measurably by changes in groundwater flow resulting from juniper expansion within that watershed.

Expansion of the juniper population may influence the erodability of soils by out-competing grasses and shrub ground cover for water and nutrients. Loss of ground cover under a juniper canopy and changes in soil infiltration may increase erodability of sites occupied by juniper. It is possible that soil erosion and sediment transport to perennial streams could increase as juniper over story increases and grass/shrub under story declines (Buckhouse 1999). The sedimentation transported is not likely to be measurable. The magnitude and intensity of erosion attributed to juniper expansion is unknown and disputed. The indirect consequence of erosion from uplands and intermittent channels to aquatic environments could be a chronic supply of fine sediment.

Without livestock grazing, there would be an increase in vegetation height that could increase the spread of wildfire, carrying it to ladder fuels and tops of trees. These fires could kill all or most of the vegetation within the burn area returning any given site to bare soil. This also increases the risk

and potential for additional overland flow, surface erosion, and sediment input into adjacent water bodies. Potential for erosion could occur during unseasonable high storm events. During normal seasonal rainfall following a fire it is unlikely for sediment to be measurable in streams. Wildfire is likely to occur in mosaic patterns throughout the project area.

Increased sediment input from wildfires into the Crooked River, Lone Pine, Squaw (Whychus), and Willow Creeks would increase the risk of those water bodies failing to meet water quality standards for sediment and turbidity. This would affect fish habitat by smothering eggs, reducing invertebrate populations or habitats, or by changing pool depths and possibly increasing summer and decreasing winter water temperatures. The risk of this happening is relatively low as there are few perennial streams on the Grassland and no proposed soil disturbance activities in any of the alternatives within the RHCAs.

Higher intensity, higher severity wildfires would also increase the potential loss of riparian vegetation. Riparian area vegetation historically developed with disturbance, particularly fire, periodically thinning or removing small areas of the existing vegetation. High intensity, high severity fires would be more likely to remove more vegetation over larger areas. This would also likely affect water quality by raising stream temperatures in the short term. It would also increase potential sediment input into streams until burned areas were re-vegetated. Alternative A has a higher fire risk and potential for this occurring than Alternatives B, C, or D because there would be no modification or change in the arrangement or continuity of fuels.

Direct effects on riparian zones and aquatic resources would not occur under this alternative because livestock grazing would be discontinued on the Grassland. Riparian vegetation would not be eaten or trampled except by wildlife. Stream banks would be protected and no stream bank shearing or post holing may occur except by wildlife. Vegetation, where trailing occurs by livestock in Class 4 streams would re-vegetate, providing an increase in filtering vegetation in the uplands.

Discontinuing livestock grazing would allow faster geomorphic recovery of intermittent and ephemeral streams, which provide water, sediment, and nutrients down stream to perennial aquatic environments. Intermittent and ephemeral streams would become stable over the long term, in the order of tens to hundreds of years without grazing.

Current grazing practices have not resulted in 303(d) listings for any stream within the Grassland boundaries. Several streams, including Crooked River from its mouth to Baldwin Dam, Squaw (Whychus) Creek, and Willow Creek, are 303(d) listed either due to historic practices or practices associated with other ownerships upstream from Grassland managed lands. None of the alternatives would result in a change in current 303(d) listings for any stream or stream segment traversing Grassland owned lands.

"No grazing" under Alternative A or "continued grazing" under the action alternatives would not be expected to have any noticeable or detectible effects to temperature or sediment to any of the above mentioned creeks since over 90 percent of the riparian areas are fenced to exclude livestock. There are some water gaps on Willow, Lone Pine, and Mud Springs Creeks. These provide livestock limited access to the stream. Some additional, non-measurable, sediment delivery into the stream would continue from this access along with that from intermittent and ephemeral stream courses.

There would be no effect on water quality associated with the few remaining unfenced springs under Alternative A because livestock would be removed. Livestock congregate at water sources. It is estimated that there are approximately four springs on the 111,571 acres of Grassland that remain unfenced to exclude livestock use.

Sediment above the historic range of variability (1850 baseline) would continue to be generated by ephemeral and intermittent streams over the long term in areas outside of the Grassland that would continue to have livestock grazing.

The risk to aquatic species would be low and approximately the same as Alternative B. In Alternative A, grass/shrub understory would decline as juniper overstory increases; however, grass/shrub understory would be consumed by livestock and wildlife under Alternative B, having a similar erosion possibility on the uplands and intermittent channels. Neither Alternative A nor B proposes anything to restore vegetation to within the historic range of variability (HRV). Juniper expansion will continue along with the predicted changes to understory such as loss of mid-sized shrubs, along with grass and forb production, producing increased bare soil (Eddleman 1983 and Buckhouse 1999). This scenario will not move the Grassland toward HRV.

3.6.3.1.2 Alternative B – Current Management

Under Alternative B grazing would be ongoing under the current management regime. No actions are proposed within riparian areas except for limited riparian grazing in the Springer and Windom riparian pastures located in the Juniper Butte Allotment. These riparian areas are no more than seeps. The actual seeps are fenced from livestock use.

In Alternative B, 92 percent of the Grassland is open to grazing by livestock. With current livestock grazing on the Grassland, most of the streams with perennial flowing water (Class 1, 2 and 3 streams) are protected from livestock grazing by fencing or cliffs. Exceptions would be in Windom and Springer Pastures in the Juniper Butte Allotment where the riparian habitat conservation area (RHCA) is used as a riparian pasture and grazed every few years for control of grasses for wildlife cover habitat. Except in riparian pastures, riparian vegetation would not be eaten or trampled by livestock. Stream banks are protected and no shearing or post holing would occur except by wildlife.

Current adaptive grazing management provides protection to perennial streams and springs through the use of riparian pastures, riparian exclosures, and off-channel watering sites.

Direct effects of sedimentation from grazing in riparian pastures would not be measurable in streams. Indirect effects of grazing on aquatic resources are low risk because of the current stable or upward range trend in uplands and protected riparian zones. Possible sources of sediment from grazing could include trailing or bank shearing along intermittent streams (Class 4) that are unstable due to past grazing or sediment and runoff from existing roads and existing grazing by wildlife. In Class 4 streams that are in close proximity to perennially flowing water there is a high probability of sediment entering streams.

No direct effects on riparian zones and aquatic resources would occur under this alternative because livestock are not grazing within riparian zones. Exceptions include grazing by wildlife and grazing within the Windom and Springer Riparian Pastures in the Juniper Butte Allotment.
In the Whychus Watershed, the Squaw Creek pasture has been in non-use for four years. It would remain closed to domestic livestock grazing to protect scenic river values and threatened bull trout.

The effects of grazing on aquatic resources are low risk because of the current stable or upward range trend in uplands and protected riparian zones. In the Deschutes South Watershed, aquatic resources are limited to two drainages that drain into Haystack Reservoir. The reservoir is fenced to preclude grazing.

Squaw Creek, Canadian, Bench, Lower Desert (except East Winter), Clevenger, Goldmine Falls, and Peninsula (currently in non-use; recommendation to close) are currently vacant or closed to grazing and would remain so.

In the Mud Springs Creek Watershed the effects of grazing on aquatic resources are moderate because riparian areas are fenced to exclude livestock. Possible sources of sediment include: trailing and bank shearing along intermittent streams that are already unstable due to past grazing, sediment and runoff from roads, and grazing in riparian areas by wildlife. Livestock grazing has been eliminated from Skull Hollow, Lone Pine, Rimrock Spring tributary, and Lithgow Creek exclosures. Any sedimentation resulting from grazing of Class 4 (intermittent) streams that are not fenced would be reduced. Vegetation would establish and allow for filtering vegetation where trailing of livestock occurs.

Neither Alternative A nor B proposes anything to restore vegetation to within the historic range of variability (HRV). Juniper expansion will continue along with the predicted changes to understory vegetation such as loss of mid-sized shrubs, along with grass and forb production, producing increased bare soil (Eddleman 1983 and Buckhouse 1999). This scenario will not move the Grassland vegetative conditions toward HRV. Juniper expansion effects are similar to those described in Alternative A above.

As stated in Alternative A, it is unknown whether loss of groundwater flow due to expansion of juniper can reduce stream flows to a measurable level in fish bearing streams. Changes would more likely to be associated with climatic wet/dry cycles which would be more likely to result in measurable increases or decreases in surface and groundwater flows and in the size of wet meadows. Belsky (1996) notes that most observations of reduction in flow from springs are anecdotal and further study is necessary. Long-term anecdotal evidence from range specialists on the Grassland suggest there have been localized increases of flow from springs that have had juniper removed (Adams 2003).

The risk to aquatic species would be low and approximately the same as Alternative A. In Alternative B, livestock consume the grass/shrub understory as juniper increases, and in Alternative A, the grass/shrub understory would decline as juniper overstory increases, having a similar erosion possibility in the uplands and intermittent channels.

Wildfire risks would be reduced somewhat under Alternative B because grazing would help to reduce the fine fuel loadings. Grazing would help to break fuel continuities and reduce the potential for high intensity, high severity wildfire. This would help to decrease the risk and potential for increased overland flow, surface erosion, and sediment input into adjacent water bodies by retaining more vegetation on the landscape. If wildfire were to occur, please refer to the direct and indirect effects described under Alternative A above.

Direct effects include livestock use in riparian areas in the Windom and Springer Pastures (no fish exist within these areas) in the Juniper Butte Allotment.

Indirect effects include potential loss of grass/shrub understory as juniper canopy increases because of lack of treatment and sedimentation to downstream sources by potential loss of grass/shrub understory from both juniper expansion and livestock grazing. Grass/shrub understory acts as filters for sediment, reducing the amount of sedimentation that enters streams. This would provide a chronic upland sediment source.

Fencing or geographic barriers protect RHCAs on Squaw Creek.

Existing livestock grazing in Alternative B would not measurably affect existing sediment sources, such as entrenchment and loss of hydraulic function in the meadow surrounding Mud Springs.

3.6.3.1.3 Alternative C – Proposed Action and Alternative D

3.6.3.1.3.1 Grazing

There are 82,923 acres open to livestock grazing in Alternative C and 88,085 acres open to livestock grazing in Alternative D. Implementation of rest rotation grazing systems in Alternatives C and D would result in decreased runoff and reduced sedimentation. Allowing one or more pastures within each allotment to rest an entire grazing season would allow plants to complete an entire growth cycle without grazing pressure from domestic livestock. Species diversity within the pasture would be more likely to increase. This would help all plants deal with the grazing pressure (physiologically) while maintaining good ground cover and root mass. This in turn would reduce runoff and surface erosion by: slowing and trapping runoff, allowing water to infiltrate into the soil profile, and trapping sediment.

Under Alternatives C and D, resting one or more pastures within each allotment each year would also help soils to recover from compaction associated with livestock grazing. In these alternatives an increase in grasses and forbs would be expected for those pastures with other treatments such as, prescribed fire, juniper control, tilling, and seeding. This would help to better distribute livestock in turn further reducing levels of compaction.

There would be no measurable effect under either Alternative C or D associated with grazing the Windom and Springer Pastures of the Juniper Butte Allotment as riparian pastures. Grazing would follow LRMP and INFISH standards and guidelines. Grazing in these pastures would be periodic, estimated to be once every three to four years for short durations, up to a maximum of three or four days. The short grazing period coupled with multiple years of rest between grazing would be expected to minimize damage or loss of riparian vegetation and encourage rapid recovery after grazing. Retention and recovery of riparian vegetation would also be expected to limit the amount and duration of sediment (associated with the grazing) input into the stream. Short, periodic grazing would also minimize the risk of stream temperature increases.

There would be no measurable effects on stream temperatures or sedimentation levels. There is an increased risk of damage to stream banks of ephemeral streams outside riparian exclosures associated with grazing under Alternatives B, C, or D. Livestock are currently excluded from almost all riparian vegetation by fences and natural barriers. Streams and springs have healthy riparian vegetation, including shrubs and trees.

The Windom and Springer Pastures have not been grazed for the past five years due to the presence of knapweed, a noxious weed. The knapweed has been sprayed over the past several years, resulting in these weed populations beginning to be controlled. It is expected that control efforts would continue. The intermittent, short-term grazing proposed for these two pastures under Alternatives C or D would not be expected to measurably affect either the spread of these populations or the effectiveness of control measures.

Stream sedimentation could be slightly higher in Alternative C than D; however, the juniper treatment and burning would increase filtering vegetation. Sedimentation would not likely show a measurable difference between Alternatives C and D.

Changes to grazing are intended to provide more ground cover and organic matter incorporation into the soil. Like Alternative B, these alternatives would have no direct effects to aquatic resources because livestock are not grazing within riparian zones, therefore, riparian vegetation would not be eaten or trampled except by wildlife.
Grazing in the Springer and Windom riparian pastures is not likely to generate measurable stream sedimentation, as the pastures are not used on a yearly basis. The purpose of vegetation consumption within these pastures is to enhance and maintain habitat for wildlife through meeting stubble height standards. In the Deschutes South Watershed, Lithgow Creek riparian exclosure would be maintained for wildlife habitat.

The indirect effects of cattle grazing related to sedimentation would be the same or less than for Alternative B because range vegetation is stable or in an upward trend and new stubble height restrictions and pasture rest would increase the rate of range condition improvement. The risk to aquatic resources from grazing is low. Indirect effects also include potential loss of grass/shrub understory vegetation with livestock grazing. This could provide a chronic upland sediment source.

3.6.3.1.3.2 Prescribed Fire

Tables 3-25 and 3-26 display the acreage of each proposed treatment for each alternative by watershed.

Table 3-25 Acres of Proposed Treatment by Watershed for Alternative C - Proposed Action, CRNG

Watershed Name	Chainsaw Juniper Acres	Chainsaw Juniper, Tilling, Seeding, and Fertilizing Acres	Prescribed Fire Acres	Mechanical	Chainsaw and Prescribed Fire	Chainsaw, Pile, and Prescribed Fire Acres
Crooked River Grasslands	3,038	914	62	0	0	0
Deschutes South	3,851	2,907	330	115	0	0
Hay Creek	0	0	0	0	0	0
Lake Billy Chinook	3,503	0	871	373	0	2,171
Lower Crooked River Valley	1,562	271	0	0	718	0
Lower Metolius	0	0	0	0	0	0
Mud Springs Creek	2,335	687	1,905	0	662	0
Steelhead	906	0	638	0	0	0
Whychus	706	0	1,750	0	256	0
Willow Creek	10,467	3,562	1,951	0	1,387	0

There are more acres for juniper treatments (chainsaw, chainsaw/prescribed fire), sagebrush/juniper cover control (prescribed fire/mechanical), and seeding treatments proposed in Alternative C (48,633 acres) than in Alternative D (29,588 acres). Increased juniper treatment would likely increase understory vegetation more in Alternative C than D.

Table 3-26 Acres of Proposed Treatment by Watershed for Alternative D - Modified Proposed Action, CRNG.

Watershed Name	Chainsaw Juniper Acres	Chainsaw Juniper, Tilling, Seeding, and Fertilizing	Prescribed Fire Acres	Mechanical Acres	Chainsaw and Prescribed Fire Acres	Chainsaw, Pile, and Prescribed Fire Acres

		Acres				
Crooked River Grasslands	2,617	914	62	0	0	0
Deschutes South	1,265	2,907	330	115	0	0
Hay Creek	0	0	0	0	0	0
Lake Billy Chinook	130	0	508	373	0	2,171
Lower Crooked River Valley	271	271	0	0	718	0
Lower Metolius	0	0	0	0	0	0
Mud Springs Creek	2,304	687	1,905	0	662	662
Steelhead	103	0	0	0	0	0
Whychus	706	0	0	0	256	0
Willow Creek	3,405	3,561	1,951	0	1,386	0

Table 3-27 (below) shows the proportion or percentage of each watershed that is being treated by one of the above methods. The number of acres and percentage within each watershed reflects the total watershed along with the Grassland acres within each watershed. Treatment acres include juniper control using: chainsaws, prescribed fire, and mechanized equipment.

Table 3-27 Total Acres of Vegetation Treatment and Percent of Each Watershed Treated by Watershed by Alternative.

Watershed	Total Watershed Acres	Grassland Acres in Watershed		Treated Acres Within Watershed	
		Alternative C	Alternative D	Alternative C	Alternative D
Crooked River Grasslands	55,942	14,397 (25%)	4886 (8.7%)	3015 (5.4%)	4886 (8.7%)
Deschutes South	37,880	13,283 (35%)	1854 (4.8%)	3139 (8.2%)	1854 (4.8%)
Hay Creek	23,159	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Lake Billy Chinook	61,582	23,752 (38%)	5139 (8%)	5105 (8%)	5139 (8%)
Lower Crooked River Valley	61,911	10,468 (17%)	3412 (5%)	2373 (3.8%)	3412 (5%)
Lower Metolius	21,629	6510 (30%)	0 (0%)	0 (0%)	0 (0%)
Mud Springs Creek	58,943	12,366 (21%)	4030 (6.8%)	5292 (8.9%)	4030 (6.8%)
Steelhead	23,405	1,993 (8.5%)	728 (3%)	726 (3%)	728 (3%)
Whychus	20,518	8,760 (42%)	1479 (7%)	1771 (8.6%)	1479 (7%)
Willow Creek	82,653	29,103 (35%)	7677 (9%)	14896 (18%)	7677 (9%)

Prescribed fire is proposed in the Willow Creek Watershed in the Blanchard Allotment, in the Whychus Watershed in the Holmes-Squaw Creek Allotment, in the Mud Springs Creek Watershed in the North and Fox Allotments, in the Deschutes South Watershed in the Cyrus and Round Butte Allotments, in the Steelhead Watershed in the Clevenger Allotment, and in the Lake Billy Chinook Watershed in the Round Butte Allotment. Many of these have steeper slopes, confined intermittent drainages, and heavier fuel loadings than in the flatter areas of the Grassland. Prescribed burns would not be ignited within 300 feet of Class 1 and 2 streams, within 150 feet of Class 3 streams and within 100 feet of Class 4 intermittent streams (FEIS, Chapter 2, Section 2.5).

Prescribed fire, alone or in conjunction with other methods such as chainsaw felling of juniper is proposed on approximately 12,706 acres under Alternative C and approximately 9,953 acres under Alternative D. This includes both broadcast and pile burning. This could lead to increased erosion because of the short-term reduction in vegetation and ground cover. The increase in the risk and level of erosion would be limited due to the relatively flat topography of most of the units and the local geology/lithology (Goodman 2004).

The level of risk and level of erosion will be further reduced by burning as proposed in both Alternatives C and D using a mosaic pattern of approximately 50 percent burned and 50 percent unburned areas within each treatment unit. Only two units (4, 22, totaling approximately 881 acres) would have 100 percent of the unit treated in this mosaic pattern under Alternatives C and D. The remaining units, numbers 1-3, 5, 9, 13-15, 22, 23, 25, 26, 47-49, and 52 in both alternatives and units 67, 68, and 81 in Alternative C, would have between 25 and 75 percent of the actual acreage within each unit treated in a mosaic pattern. The remainder of each unit would be untreated. Under Alternative C, approximately 6,816 acres or approximately 43 percent of the total proposed treatment acres would be unburned. Under Alternative D, approximately 5,671 acres or approximately 57 percent of the total proposed treatment acres would be unburned. The combination of the mosaic burn prescription coupled with the retention of unburned areas within treatment units would not prevent erosion and runoff but would quickly capture and retain both runoff and sediment before leaving the treatment unit, preventing it from reaching perennial streams. Additionally, no prescribed fire is proposed within Riparian Habitat Conservation Areas (RHCAs) adjacent to stream courses. These buffers (RHCAs) would further trap any sediment that may eventually leave the treatment area before it enters perennial streams.

Experience suggests that burning with the objective of creating a mosaic of conditions across the landscape, coupled with cool burns, results in rapid re-vegetation of burned areas by grasses and forbs (Goodman pers. comm. 2004). This would further reduce the risk and amount of erosion.

Scheduling burns for the spring of the year and using cool burns would leave more vegetation alive after the burn. Although there could be localized increased erosion and deposition of sediment, the combination of untreated areas (mosaic), and relatively flat terrain within burned areas would minimize the amount and extent of such effects. It would also be expected that new grasses would sprout and grow in the new sediment deposits thus stabilizing these deposits.

Use of existing roads and trails for fire control lines would result in no additional erosion or sediment delivery to streams or other water bodies. No hand or dozer lines would be constructed therefore no additional soil would be exposed.

Long term, Alternatives C and D would increase the amount and distribution of ground cover resulting in decreased levels of erosion and ultimately, decreased sediment delivery into streams and other water bodies.

3.6.3.1.3.3 Juniper Density Control, Chainsaw Felling

Neither alternative would treat more than nine percent of the watershed acres over the next ten years (with the exception of Alternative C that proposes to treat juniper in the Willow Creek Watershed on approximately 14,896 acres or approximately 18 percent of the total watershed acres). Under Alternative C, approximately 56 percent of acres (27,095 acres) proposed for juniper control would remove juniper using chainsaws only. No ground disturbance would occur and no other vegetation would be removed in association with these treatments. This would result in no measurable change in the quantity of overland flow or in the amount of surface erosion above current levels. Any additional water reaching the soil surface would be intercepted and infiltrate into the soil because it would be captured and retained by residual vegetation. Retention of slash materials on site would further reduce the risk and amount of runoff and surface erosion.

Under Alternative D, the effects would be similar except that the number of acres treated using chainsaws only would be 10,803 or approximately 37 percent of the acres proposed for juniper control.

Neither Alternative C nor D would result in measurable amounts of sediment input into perennial streams. Retention of vegetation and slash coupled with the presence of untreated buffers would be expected to reduce the risk of increased overland flow and surface erosion and therefore limit the amount of runoff and sediment reaching perennial streams. Chainsaw cutting would have no measurable effect on aquatic species.

3.6.3.1.3.4 Chainsaw Felling with Prescribed Fire

Alternatives C and D both propose to treat approximately 5,196 acres (Units 3, 4, 5, 14, 22, 23, 47, 48, and 52) using a combination of cutting juniper with chainsaws followed by prescribed fire. The effects of prescribed fire and chainsaw felling of juniper as individual actions were discussed in the previous sections above. This section discusses the combined effects of those combined actions.

Under both alternatives the combination treatment acreage would use a cool broadcast burn to create a mosaic across the unit. The percent of each unit to be treated would vary from approximately one third (Unit 14, approximately 880 acres) to 100 percent (Units 4 and 22, totaling approximately 881 acres). Again, even at the 100 percent treatment level (juniper felling will occur over 100 percent of the area) the prescribed fire treatment will burn in a mosaic of approximately 50 percent burned and 50 percent un-burned across the unit.

As noted in the discussion on chainsaw felling of juniper, there would be no measurable effect on runoff or erosion rates associated with the felling of the juniper. Lopping and scattering of the slash would further help to reduce the risk of increased runoff and erosion. These effects would continue until the unit was burned, approximately seven years after the initial juniper treatment if this meets fuels and seeding requirements. The cool burn prescription would be expected to remove any remaining fine and some larger fuels. This would be expected to result in a small but immeasurable increase in the risk of increased runoff and erosion. This increased risk would continue until burned areas were re-vegetated with adequate ground cover, approximately one to two years post-burn.

Because slash would be lopped and scattered, the risk of high intensity burning would be limited or eliminated. This would reduce or eliminate the potential of creating hydrophobic soils that would decrease water infiltration rates and increase overland flow and surface erosion. Burn prescriptions propose to treat varying percentages of the units ranging from approximately 33 percent in Unit 14 to 100 percent in Units 4 and 22 (100 percent of the juniper would be cut, lopped and scattered, the follow-up prescribed fire would only burn part of each unit in a mosaic pattern as described above). Units 3, 5, and 23, totaling approximately 1,006 acres, would have approximately 50 percent of the unit burned. Unit 52, approximately 257 acres, would have approximately 75 percent of the unit burned. Fire would be applied to create a mosaic of conditions within each treated area within each unit after burning. These would range from areas of complete or near complete local mortality of existing vegetation to no burning and no local mortality.

The risk of runoff and surface erosion would increase in proportion to the number of acres treated by fire. Units with 33 percent of the unit treated with fire would have a lower risk than a 50 percent burned unit which in turn, would have a lower risk than a unit with 75 percent of its area burned. However, the use of: cool burn prescriptions, burn practices to create a mosaic of mortality across the unit, and the retention of approximately 25 to 67 percent unburned vegetation in most units, would be expected to maintain runoff and erosion rates at or near pretreatment levels. The combination of residual vegetation within treatment units coupled with untreated areas between

treatment units and perennial streams would result in no detectable increase in either runoff or sediment entering perennial streams. Additionally, no prescribed fire is proposed within Riparian Habitat Conservation Areas (RHCAs) adjacent to stream courses. These buffers (RHCAs) would further trap any sediment that may eventually leave the treatment area before it enters perennial streams.

The presence of residual vegetation within treatment units would also help to hasten revegetation and recovery within a relatively short time period, several years at most. This would further serve to restore pre-treatment runoff and erosion rates.

In the unburned portions of these units, slash would continue to provide protection to soils and either eliminate or limit the risk of increased runoff and rates of erosion. This would be true for both unburned areas within the burn units and those areas outside of the treatment units.

The combination of juniper cutting and prescribed fire would have no measurable effect on water quality or quantity in these units under either alternative.

The risk of increased runoff and erosion increases as slope increases. With the exception of Unit 3, all units having this combination treatment prescription are located on slopes of less than 30 percent. There would be no measurable increase in risk of increased runoff or erosion due to slope in these units under either alternative.

Unit 3 is located on slopes greater than 30 percent. Steep slopes are more subject to increased runoff and erosion when vegetation is removed. The treatment prescription for this unit under both alternatives proposes to treat approximately 50 percent of the unit acreage or approximately 310 of the 621 unit acres. The combination of, one half of the unit being untreated coupled with, the use of a cool burn and a mosaic burn pattern would be expected to result in no measurable increase in runoff or sedimentation levels. There would be no measurable effect on water quality associated with the combination of juniper cutting and prescribed fire. Portions of Unit 3 are adjacent to Mud Springs Creek. Mud Springs Creek has been fenced to exclude livestock for over 20 years and has a well developed riparian zone to trap any sediment before it could enter the drainage. Additionally, any sediment that may be transported from Unit 3 would enter the Mud Springs drainage down stream from where perennial stream flow occurs.

3.6.3.1.3.5 Tilling, Seeding, Fertilization and Juniper Cutting

Both Alternatives C and D propose cutting juniper followed by tilling, seeding, and (where appropriate) fertilizing in historically seeding areas on 8,344 acres.

The effects of the cutting of juniper were discussed previously and will not be further discussed here. This section will discuss the effects of the tilling, seeding, and fertilization and the combined effects, if any, of those activities in conjunction with the juniper cutting.

Historic grazing and farming practices in these units compacted soils resulting in reduced infiltration rates and increased rates of runoff and erosion. Tilling would help to ameliorate any existing and remaining compaction in treated areas. This would result in increased infiltration rates and decreased rates of runoff and erosion.

Use of equipment such as farm or crawler tractors to pull tilling, seeding, and fertilizing equipment would have no measurable effect on runoff or erosion rates. Tractors either wheeled or crawler would pull equipment that would conduct single pass tilling, seeding, and fertilizing. This would serve to further break up any additional compaction associated with the tractor passage.

Short term, tilling and seeding removes existing vegetation and exposes the soils to increased risks of elevated runoff and erosion rates. Units with larger percentages of tilled and seeded areas would have higher risks and potentially higher rates of runoff and erosion.

However, within three to five years, tilling to a depth of up to twelve inches would improve soil infiltration rates and improve the water holding capacity of that soil. The rough soil surface created by tilling and seeding equipment would also help to slow and capture water, further decreasing the amount of runoff and subsequent soil erosion.

Tilling, seeding, and fertilizing would occur as a mosaic within each treatment unit. Approximately 33 percent of Unit 27 (250 acres) would be tilled and seeded under each alternative. There would be 508 acres within the unit that would not be treated.

Units 7, 8, 11, 12, 27, 28, 29, 36, 38, 39, and 42-45 totaling 7,226 acres, would have approximately 50 percent of the unit acres tilled and seeded under each alternative. There would be 3,342 acres within those units that would remain untreated.

Unit 46, totaling approximately 88 acres, is only proposed to have approximately 75 percent of the acres treated. It would only be seeded and fertilized after cutting the juniper.

The risks and rates of runoff and erosion within treatment units would be reduced by the presence and retention of untreated blocks of vegetation that would help to slow surface water movement and capture any sediment. Working in conjunction with the increased roughness of the soil surface and increased infiltration rates of the tilled soils, this would result in no measurable increase in runoff or sedimentation at the treatment unit boundary. As a result, there would be no measurable increase in runoff or sediment entering perennial streams associated with tilling and seeding activities (Goodman 2004).

Tilling and seeding would necessitate the removal of cut juniper from treatment areas, to allow machinery to operate. Areas that are scheduled for tilling and seeding currently do not contain a high density of juniper nor are the trees large in size. There will be little juniper slash to remove from these sites. Subsequently there would be a slight reduction of material to protect the soil surface from raindrop impact or to help slow overland flows (runoff) and trap sediment on the tilled and seeded sites. Slash would contribute to slowing runoff, trapping sediment, and protecting soils from raindrop impacts in those areas not subject to tilling and seeding.

Tilling and seeding are proposed to be implemented during the fall or winter to utilize coming precipitation. This would increase the probability of successful regeneration and more rapid re-vegetation of tilled and seeded sites, reducing the time that soils are exposed and subject to runoff and erosion.

Seeding using native deep-rooted species or desirable cultivars also helps to limit runoff and reduce erosion. Many native vegetation species, particularly the bunchgrasses, are deep rooted. They help to build up the litter layer and organic content of the soil, which in turn helps to slow runoff and increase infiltration rates, further reducing erosion.

Tilling and seeding would occur along the contour wherever possible (FEIS, Chapter 2, Section 2.5). This would eliminate or minimize the potential of water flowing directly down slope and the rate and amount of erosion and sediment moved off site. Water would be more readily trapped by the increased roughness of the soil surface and more apt to infiltrate into the soil. Sediment, if produced by surface erosion, would be captured, enriching the soil at those sites.

Fertilizer would be applied if soil analysis indicates a need. It is unknown at present how many, if any, of the proposed tilling and seeding acres would benefit from fertilizer applications. Fertilizer

may help to improve the productivity of the soils to which it is applied. Plants might become more vigorous and healthy. It may help to improve the establishment and survival of seeded vegetation. In both instances, improved plant growth and vigor helps to reduce runoff and erosion rates and levels.

There is no potential for fertilizer to enter perennial streams. All applications would be made using ground based equipment. This would reduce or eliminate the risk of drift off site. Only Units 11 and 42 lie within a mile of a perennial water source (Willow Creek). Highway 26 and its associated drainage system, which would preclude entry of fertilizer into the stream course, separate both of these units from Willow Creek. There are no shallow water tables beneath any unit proposed for tilling, seeding, and fertilization; therefore entry of fertilizer into underground water sources is unlikely. No units are proposed within riparian areas or adjacent to perennial streams except for Units 11 and 42 as noted above. All perennial streams are buffered with untreated vegetation limiting the potential of overland flow transporting fertilizer into perennial streams. A state highway and its incorporated drainage system further buffer Units 11 and 42.

The mosaic treatment prescription coupled with the retention of from 25 to 67 percent of the treatment unit in an untreated state in all units reduces the risk of runoff. This increases the potential that all applied fertilizer would remain within the treatment unit boundaries.

3.6.3.1.3.6 Mechanical Treatment

In Alternatives C and D there is a proposal to mow 488 acres in the vicinity of Round Butte to provide a wildfire barrier from housing developments. There would be little or no measurable affect on water quality under either Alternative C or D. Vegetation (brush) would be "mowed" down to a height of not less than twelve inches. Mowing would expose little to no bare soil.

There would be limited, localized impacts on soils under both Alternatives C and D. The machine is a small "Bobcat" type tractor with rubber tires. This would result in a small, non-measurable increase in the risk of elevated erosion and overland flow from soil compaction and displacement associated with the tractor. This would be largely negated by the retention of the existing vegetation that would trap, and retain on site, any material subject to erosion. There would be no or very limited soil compaction. To detrimentally compact soils, several trips over the same area would have to occur. The proposed treatments would consist of only single trips over any given piece of ground. Any compaction that did occur would be naturally mitigated through freeze/thaw actions and root growth.

Slightly greater impacts, particularly increased soil disturbance, would be expected if mowing were accomplished using a Bobcat with rubber tracks. This disturbance would be primarily located when the vehicle turned. The area disturbed would be larger than that expected from a wheeled tractor. Neither tractor would be expected to result in a measurable increase in: erosion rates, overland flow, or sediment input into streams.

The power mowing ‘head’ can also be attached on the end of the arm of an excavator. This scenario would accrue greater impacts than either "Bobcat" type tractor. An excavator has metal tracks, which would result in more soil disturbance where the machine turns. Since the percent of area where the machine would actually be turning would be such a small percentage of the treatment area, no noticeable or detectable impacts are expected. As with the "Bobcat" type tractor, only one pass over each piece of ground would be needed which would not result in any detectable impacts related to compaction.

These treatments are proposed at the edge of pastures where housing tracts on private land are located. This would reduce fuel loadings and the risk of a high severity, high intensity wildfire

moving off of or on to Grassland managed lands. If such a fire occurred, it would remove vegetation resulting in increased overland flows and erosion rates.

As stated, proposed mowing treatments are located very far from these perennial streams and would result in little or no measurable impact on water quality in Squaw Creek, Mud Springs Creek, Willow Creek, or Lone Pine Creek. Each stream is buffered from proposed treatments with a wide, well-vegetated strip of vegetation that would trap and filter any sediment coming from the treatment area. The amount of sediment that would likely reach water would be expected to be non-measurable (Goodman 2004). None of the proposed mowing treatments under either alternative would result in any changes to currently 303(d) listed streams (Goodman 2004).

3.6.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Cumulative effects from past, present and reasonably foreseeable actions have been considered in the effects for the Crooked River National Grassland FEIS alternatives. From the list of ongoing projects they would not likely cause measurable increase in sedimentation in streams.

The following actions are ones that were considered for cumulative effects on fish species and habitats:

- Installation and maintenance of fences associated with springs and wildlife.
- Maintenance of existing utilities, including power lines, pipelines, and communication facilities.
- Mineral material sources to provide material for road maintenance to the Forest Service, Jefferson County, and the Oregon Department of Transportation.
- Suppression of wildfire. The number of acres burned per year over the past 20 years on the Grassland has averaged approximately 2,500 acres.
- Moving juniper to seral conditions closer to the Historical Range of Variability (HRV) through chainsaw cutting of western juniper.
- Deschutes Valley Water municipal water line, to serve the City of Madras, would be constructed on the northwest portion of the Grassland in the next 5 years. This project would cross the Round Butte Allotment.
- Noxious weed control under the 1998 Ochoco National Forest and Crooked River National Grassland Integrated Weed Management Plan. This includes hand pulling and herbiciding weeds.
- Permitted recreation events, including dog field trials, endurance horse riding events, outfitter guide, cowboy shoot, guided hikes, and bicycle events.
- Expansion and rehabilitation of the Round Butte material site.
- Fuel management activities for 2004 include 500 acres on the west side of the Grassland, 1,000 acres near Round Butte and 1,000 acres in the Cyrus Hills.
- Skull Hollow is in need of rehabilitation that would include 1000 acres of vegetation work (primarily juniper control) and two miles of riparian improvement. Associated work would include off-site water development, relocation of fences, possible road obliteration and/or movement; and trail construction or movement.
- The Blanchard well, located in the McMeen Pasture of the Grizzly Allotment, has been in operation for over 100 years. It is in need of upgrading either the pump or drilling a new hole.
- Stream and riparian enhancement projects, such as placement of large woody material, is anticipated. Planting of native hardwoods, such as aspen in riparian areas and other hardwood enhancement project is anticipated.
- The Oregon Department of Corrections will build a medium security prison near the administrative boundary of the Grassland near the city of Madras. Construction is expected within the next decade.

- The city of Madras plans to expand their existing water treatment facility within the next decade. The facility is located near the Grassland administrative boundary.
- Juniper within road Right-of-Ways would be cut as needed to ensure public safety.

3.6.3.2.1 Alternative A

Cumulative effects to PETS Aquatics can be found in Section 3.8.3 later in this chapter.

Cumulative effects include the above listed actions and the implementation of ending livestock grazing. This could allow faster geomorphic recovery of intermittent and ephemeral streams providing water, sediment, and nutrients to perennial aquatic environments. Intermittent and ephemeral streams would become stable over the long term, in the order of 10's to 100's of years without grazing. Sediment above the historic range of variability (1850 baseline) would continue to be generated by ephemeral and intermittent streams over the long term.

Juniper is expanding beyond its historic range of variability. Alternative A could result in potential loss of grass/shrub understory as juniper canopy increases because of lack of treatment and juniper expansion

Further expansion of juniper populations into the Grassland may intercept soil moisture contributing to stream flow. The Grassland is in a semi-arid environment where soil moisture is generally deficit. Soil recharge during early spring provides moisture for stream flow.

Effects from implementation of most of the list of potential projects on fish habitat and populations in Alternative A are not a concern. As stated above, no grazing will allow for slow recovery of the riparian areas. The majority of future projects would be implemented outside of the riparian areas and stream channel systems therefore they would not contribute to increases in sediment, temperature, or decreases in riparian habitat stability. Instream habitat restoration would have a short term impact on sedimentation and bank stability, however, the long term affects, combined with the implementation of no grazing would be for full recovery of the stream system within the Grassland. Riparian restoration and spring fencing would allow for recovery of these areas more quickly and implementation of these types of projects will be done to protect stream systems from increased sediment.

No actions are proposed within riparian areas except for limited riparian grazing in Springer and Windom riparian pastures in the future (Willow Creek Watershed). Fencing or geographic barriers protect RHCAs. There is one water crossing on Squaw Creek (Whychus Watershed) on the Grassland but it is not currently being grazed by livestock.

Water withdrawal and sediment from roads are a continuing legacy. The impact from these activities would continue into the foreseeable future. Road maintenance and road decommissioning is expected to continue. Maintenance and decommissioning would reduce sedimentation.

None of the proposed activities (tilling, seeding, burning, and juniper cutting) would cause a measurable increase in sedimentation in streams or affect 303d listed streams for temperature (Squaw Creek, Willow Creek, and the Crooked River). In the areas where there is hand piling followed by burning, the effects would result in less sedimentation than in burning across the landscape. However, in either case, the sedimentation would not be measurable and would have a little affect on streams. Willow Creek is on the State of Oregon 303d list for water temperature; Squaw Creek is on 303d list for water temperature for rearing and spawning; and the Crooked River is on the 303d list for pH, fecal coliform, and temperature. All would be expected to remain on the list. Fecal coliform and pH testing on other streams on the Ochoco National Forest indicated that the only areas that had higher than baseline values were below beaver dams (J.

Seymour pers. Comm. 2004). The same would be expected on the Grassland; therefore proposed actions are not expected to have any impact on pH or fecal coliform levels.

Prescribed fire would not be started within RHCAs but may creep inside the RHCA. Management actions would take place in the uplands, possibly resulting in some short-term sediment production that would not be measurable over baseline conditions.

Adaptive range management has improved the upland condition and the riparian zones and the trend is generally upward (Jefferson County 2000). This would be expected to continue.

3.6.3.2.2 Alternatives B, C, and D

Cumulative effects on aquatic resources, would take the form of changes in habitat quality and quantity, changes in water quality and flows, and changes in aquatic species numbers and/or assemblages. Proposed actions and actions taken on private property (e.g. water withdrawal, riparian grazing) could combine to cumulatively affect aquatic species. It is important to note that the overall condition of the Grassland will be maintained (Alternative B) or improved (Alternatives C and D) from its current state. Cumulative effects from implementation of foreseeable actions that might be negative would be either partially or fully ameliorated by the beneficial effects of the implementation of Alternatives C and D from reduced sediment coming from the Grassland and from increases in water quality as riparian habitats are restored throughout the Grassland.

The likelihood of negative effects to aquatic species as a result of cumulatively implementing these proposals is low because water quality, habitat and species issues are presently due to water withdrawal (outside the scope of the proposed actions) and sediment from dispersed sources (roads) (USDA 2003). Sediment from the Grassland uplands and riparian areas will be reduced through implementation of the proposed Alternatives B, C, and D. The majority of future projects would be implemented outside of the riparian areas and stream channel systems therefore they would not contribute to increases in sediment, temperature, or decreases in riparian habitat stability. The treatments are designed to improve vegetation habitat and would increase the filtering vegetation in the uplands. With the use of the PDCs under the action alternatives there could show a decrease in sedimentation to stream.

The Crooked River, Deschutes River, and Squaw Creek also have the disadvantage of being at the downstream end of rapidly developing drainage basins in Oregon. If proposed management actions are implemented the effect is more likely to be beneficial as a buffering effect to rapid development. Grazing administration would continue to protect riparian areas that act as refugia during water withdrawal periods.

Private lands located within and adjacent to the Grassland boundary are continually changing ownership. Weyerhaeuser recently sold a large tract of land (over 1,000 acres) within and adjacent to the Lower Desert Allotment. Private in-holdings on the Peninsula Allotment are not being developed and were open-space in the past. Approximately half of the Holmes Pasture is privately owned and may be developed in the near future.

Development of homes and roads increases the runoff and could increase the erosion rate for Grassland allotments that are downstream from the Lower Desert Allotment and the Holmes Pasture.

3.6.3.3 Alternative Summary

Alternative C would treat more acres and thus would move more area toward the desired historic range of variability and has the potential to get the Grassland to meeting the desired conditions sooner than any of the other alternatives. Alternative C also has the highest potential risk for short-

term erosion and sedimentation. However, under all alternatives, no measurable effects to the hydrologic resource would occur.

Alternative D would also move the Grassland towards meeting the desired conditions but at a slower rate than Alternative C.

Alternative B would continue the current management practices and may continue to move the Grassland slowly towards meeting the desired conditions. The lack of prescribed fire and juniper thinning would allow juniper expansion to continue and thus the conversion of grassland and shrub lands into juniper woodlands. This trend would not meet the desired conditions for the Grassland.

Alternative A would not be likely to move the Grassland toward meeting desired conditions. The lack of prescribed fire and juniper thinning would allow the juniper expansion to continue and thus the conversion of grassland and shrub lands into juniper woodlands. This trend would not meet the desired conditions for the Grassland.

Alternative C moves the area to desired future conditions the fastest, followed by Alternative D then Alternative B. Alternative A would not move the Grassland toward desired future conditions.

The proposed treatments under Alternatives C and D would treat such a small percentage of the watershed (0-18 percent of any given sub-watershed) over a ten-year period that any sediment that is produced would be within the natural range of variability for such systems. Fire, erosion, and mass wasting are all natural processes that have occurred for thousands of years. Erosion and mass wasting are not steady state processes that produce a constant amount of sediment every year.

Implementation of proposed treatments under either Alternative C or D coupled with past, present, or reasonable foreseeable vegetation management projects such as the Grizzly juniper control project, the Skull Hollow Prescribed Burn Project, and other prescribed burn projects would not result in any changes to current 303(d) listings for Squaw Creek, Willow Creek, or the Crooked River because these projects do not effect riparian vegetation, shading or bank stability.

Management activities would not result in 303(d) listings on currently unlisted segments of these or other streams for temperature or flow levels because no actions are proposed within riparian areas or adjacent to these water bodies.

3.6.4 Forest Plan Consistency

Alternatives A, B, C, and D using the project design criteria (FEIS, Chapter 2, Sections 2.5, 2.5) are designed to meet INFISH (USDA 1995) and PACFISH (USDA 1994) Riparian Management Objectives and to follow the Standards and Guidelines for Timber Management, Grazing Management, and Fire/Fuels Management (Appendix K). The Alternatives also follow the Project Design Criteria as stated in the *Joint Aquatic and Terrestrial Programmatic BIOLOGICAL ASSESSMENT for Lands within the Deschutes Basin Administered by the Bureau of Land Management Prineville Office and the Deschutes and Ochoco National Forests 2003-2005* (Appendix N).

3.7 Wildlife

3.7.1 Models Used for the Analysis Process

Two models, the Viable Ecosystem Management Guide (VEMG) and WILDHAB, were used to conduct much of the analysis on the effects of the proposed actions on wildlife species and habitats.

3.7.1.1 Viable Ecosystems Management Guide

VEMG was used to identify the historic range of variability (HRV) of different successional stages within the two basic plant communities (juniper woodlands and ponderosa pine). VEMG was also used to identify how the current quantities of these successional stages on the Grassland administered lands compared to what historically occurred (HRV). The difference between HRV and what presently occurs helped to identify what seral/structural stages need to be treated to move toward or into HRV and which need protection or non-management because they are currently rare as compared to historic conditions. A more complete discussion of the "Historic Range of Variability" can be found in this FEIS, Chapter 3, Section 3.1 or within the Viable Ecosystems Management Guide (USDA 1994).

The results from the VEMG analysis were also used to help analyze the effects of the various alternatives on wildlife and their habitats. Table 3-28 displays the seral/structural HRV for the juniper plant association group (PAG). These seral/structural stages represent habitat for the various species present on the Grassland. Indicator wildlife species were chosen to look at the effects of proposed management scenarios for each seral/structural stage.

Forest-wide wildlife habitat estimates and effects were calculated acknowledging the following assumptions:

- Vegetation mosaics occurred over the landscape in differing abundance through time.
- The complement of native wildlife species on the Grassland adapted over time to be successful at reproducing within the historic vegetation mosaics.
- Historic vegetative conditions provided certain habitats and functions that can provide a baseline against which existing conditions can be measured and compared.
- Substantial departures from that set of historic conditions increases the risk of compromising the viability of some or many of the species adapted to those conditions.
- Predicted effects on indicator wildlife species assume that the species' habitat is limited (i.e. other effects such as hunting or pesticide use for example are not limiting population size or distribution).

3.7.1.2 Wildlife Habitat Model

The habitat estimates calculated using VEMG were then used in conjunction with the WILDHAB model to perform the effects analysis.

The Ochoco National Forest developed a wildlife relational model (WILDHAB) that works in conjunction with the VEMG. It uses Microsoft Excel spreadsheet analysis tools nested within Geographic Information System (ArcInfo) spatial analysis tools (Kuk 1994).

The model was based on the following assumptions:

- The amount of reproductive, not foraging habitat is the limiting factor to a species' utilization of a home range.
- Reproductive habitat provides foraging habitat.
- The important limiting factor to a species in a watershed or landscape is the number of reproducing pairs and this number of pairs is directly related to the amount of reproductive habitat available in the watershed.

- Inter-species competition would not limit the use of a home range if sufficient habitat exists within a given spatial area.
- Because VEMG classifies seral/structural stages based upon the coarse vegetative structural characteristics (overstory canopies) across a given landscape, analysis could only be done on the coarse acres calculated to be present in the analysis area for a given species. Habitat acres and areas identified by the wildlife model as suitable habitat would only serve to indicate to managers where key areas for a given species could be. This model could also point out coarse habitat deficiencies in specific areas for a given species. Many times special, fine scale features such as cliff faces, riparian vegetation, or snags ultimately determine a species' presence or absence. For example, in a given area, this model can estimate acres of early seral, grass, forb, and shrub stages in the western juniper PAG. These are key areas for prairie falcons. A more site-specific analysis would be needed to evaluate the special needs of the species; in this case cliff faces.

3.7.1.3 Methodology to Calculate Existing and HRV for Wildlife Habitat

All species of wildlife use vegetative and other physical characteristics to meet their biological needs. For this analysis, habitat for a given species was broken into reproductive and foraging categories based upon the methodology contained in Wildlife Habitats in the Managed Forests, the Blue Mountains of Oregon and Washington (Thomas 1979). Because reproductive habitat is assumed to be the limiting factor for species viability and is generally the habitat in the most limited supply, foraging habitat was not estimated when discussing HRV.

A link was made between vegetative seral/structural (S/S) stages and the habitat needs of a given species using Thomas' Blue Mountain Guide (1979) and other research available in 1994. In 2003, this model was updated to include Grassland specific species.

Each wildlife species utilizes a few to several S/S stages. Each S/S stage utilized by a given species was included in the HRV calculation for the species analyzed. Historic vegetative conditions for the Ochoco National Forest (ONF) and Grassland were determined for the 1820-1900 time period. Sources of information for describing these conditions included the Ochoco National Forest Establishment Report (Hogdson 1916), USDA publications circa 1900, land survey notes, and anecdotal information from various sources. The proportion of each plant association group that historically occurred in each of the above cell categories comprises the reference for seral/structural stage composition. These proportions are expressed as a range, which recognizes the dynamic nature of the system and changing percentages of different stages over time.

Once it is known which S/S stages a given species uses it is possible to combine those acreage figures to determine habitat for that species. A spreadsheet was programmed with the S/S stages the species being analyzed required. The spreadsheet links the species information and the vegetative outputs of the VEMG.

Once the link has been completed, the HRV acre values for a given species' habitat are calculated. This gives a measure to determine if a given species habitat is above or below the historic range that is thought to have occurred for that species.

For example, pygmy rabbit habitat includes shrub (E1s) and small tree (M2) stages in western juniper. Table 3-28, displays all seral/structural stages and HRVs for the western juniper PAG. To calculate existing pygmy rabbit habitat, add 7,748 acres (E1s) and 22,118 acres (M2) for a total of 29,866 acres. The HRV is calculated by adding the low range acres for both E1s and M2: 38,170 + 0 = 38,170 acres. Then the high range acres for both E1s and M2: 53,438 + 10,906 = 64,344 acres. So, for the pygmy rabbit habitat, the HRV is from 38,170 acres to 64,344 acres and existing is 29,866 acres. The Grassland is deficient in habitat for the pygmy rabbit by 8,304 acres.

Table 3-28 (below) displays existing S/S stage acres and HRVs for these stages by percentage and by acres for the western juniper PAG on the Grassland. These numbers were adjusted to account for unsuitable wildlife habitat (past seeded acres). The explanation of how these numbers were adjusted follows Table 3-29.

Table 3-28 Existing S/S Acres, and HRV by Percentage and by Acres for the Western Juniper PAG on the Grassland (adjusted to account for unsuitable wildlife habitat).

Western Juniper			Historic Range of Variability			
Seral Structure	**Existing Acres**	**Existing Percent**	**Low End Percentage**	**High End Percentage**	**Low Range Acres**	**High Range Acres**
E1g	4,012	3.7%	15.0%	21.0%	16,359	22,902
E1s	7,748	7.1%	35.0%	49.0%	38,170	53,438
M2	22,118	20.3%	0.0%	10.0%	0	10,906
M3	14,579	13.4%	5.0%	10.0%	5,453	10,906
L4a	254	0.2%	0.0%	0.0%	0	0
L4b	2,076	1.9%	15.0%	30.0%	16,359	32,717
L5a	0	0.0%	0.0%	0.0%	0	0
L5b	0	0.0%	5.0%	12.0%	5,453	13,087

Vegetation overstory cover may be interpreted from satellite photography. Satellite interpretation can identify if a given area is dominated by grass, shrub or tree cover. It is also adequate to identify dominant tree species (i.e. ponderosa pine vs. juniper) but is inadequate for the identification of dominant grass and shrub species in treeless landscapes or under story vegetation in conifer dominated landscapes.

Total vegetation species identification is important for wildlife habitat evaluation. Many Grassland wildlife species rely on certain types of grasses and shrubs such as native bunchgrasses and sagebrush for either foraging or as nesting cover.

Most non-native grasses and shrubs provide marginal habitat or are unsuitable for many wildlife species. Because satellite imagery is limited in its ability to differentiate native from non-native grass and shrub species, it is difficult to quantify the amount of suitable grass and shrub dominated habitat in an area such as the Grassland, where much modification of native plant communities occurred during the homestead era.

Due to this difficulty in separating habitats dominated by native vegetation from those that are dominated by non-native vegetation, shrub and grass habitat data were adjusted using information collected from the 2001 range ecological site condition and trend survey conducted by the Natural Resources Conservation Service (NRCS) (USDA 2001). The NRCS identified acres as either "seeded" or "native". It was determined that approximately 59,000 acres on the Grassland were "seeded". These areas consist mainly of old homesteads and farmlands that were seeded to a mix of non-native species in the 1960s and 1970s (most recently). Not only were these areas seeded, but they were also sprayed repeatedly with herbicides to favor grass and eliminate shrubs.

Most of these treated areas are considered unsuitable wildlife habitat. While many of these areas may be useable for foraging, many of the necessary components of reproductive habitat are missing. Reproductive habitat is assumed to be the limiting factor for most wildlife on the Grassland and is the basis for evaluation in the WILDHAB model.

Because satellite imagery is unable to differentiate between suitable and unsuitable wildlife habitat in the grass and shrub habitats, the calculated wildlife habitat acres for grass and shrub habitats calculated by the WILDHAB model were reduced by approximately 40,000 acres. This figure is the best estimate of unsuitable wildlife habitat derived from the NRCS data. Not all of the sites reseeded in the past were considered unsuitable habitat. Evaluation of suitability of previously seeded acres was made on a case-by-case basis, based upon the NRCS data.

Table 3-29 (below) displays estimated vegetation acres from VEMG and the numbers that were adjusted for wildlife habitat based on NRCS data. The adjusted acres were used by WILDHAB to calculate habitat estimates.

Table 3-29 Vegetation Acres from VEMG and Numbers Adjusted for Suitable Wildlife Habitat Based on NRCS Data.

VEMG Numbers		Acres	Adjusted with NRCS Data		Acres
Western Juniper	E1g	19,980	Western Juniper	E1g	4,012
	E1s	37,104		E1s	7,748
	M2	30,397		M2	22,118
	M3	18,539		M3	14,579
	L4a	530		L4a	254
	L4b	2,507		L4b	2,076
	L5a	0		L5a	0
	L5b	0		L5b	0
Total		**109,057**	**Total**		**50,787**

3.7.2 Habitat Specialists

3.7.2.1 Current Management Direction (LRMP, FSM, etc.)

There are no goals, objectives, desired future conditions, or standards and guidelines specifically for habitat specialists in the LRMP.

3.7.2.2 Affected Environment

The Grassland provides habitat for an estimated 280 species of amphibians, reptiles, birds, and mammals, and 20 species of fish. Most wildlife habitats on the Grassland are associated with the juniper plant association groups (PAGs) because that is the most abundant habitat on the Grassland. The approximately 1,700 acres of dry ponderosa pine plant associations on the west side of the Deschutes River provide habitats for additional species that use these slightly higher productivity sites.

VEMG defines habitat specialists as species with the most specific habitat requirements. These species will react the fastest and the most significantly to a change in their habitat because they are highly specialized to use a particular habitat niche. The habitat specialist list for the Grassland includes species that are found on endangered, threatened, and sensitive species (PETS), neotropical migratory birds (focal species), raptors, and management indicator species lists.

Species discussed in this habitat specialist section include: the least chipmunk, brown creeper, American goldfinch, pine grosbeak, horned lark, pygmy nuthatch, California and mountain quail, bighorn sheep, Belding's ground squirrel, and gray squirrel. These are the habitat specialists that did not fall into another category specifically highlighted later in this document. Habitat specialist that are also PETS, raptors, management indicators, etc. are described elsewhere. A complete list of Grassland habitat specialists can be found in Appendix L.

Table 3-30 (below) displays these habitat specialists, their existing habitat acreages, the estimated historic range of variability (HRV) of habitat acreages, and the difference, if any, between existing and historic habitat acreages. All acres were generated through the WILDHAB model.

Table 3-30 Habitat Acreages for Habitat Specialists including Existing amount, the Historic Range of Variability (HRV), and the Difference between Existing and HRV.

Habitat Specialists	Existing	HRV Range		Relation to HRV
	Acres	Low Acres	High Acres	Acres over (+), under (-) or within (0) the range
American Goldfinch	1725	949	3122	0
Belding's Ground Squirrel	4012	16359	22902	-12347
Bighorn Sheep	34466	54701	88022	-20235
Brown Creeper	773	604	1639	0
California Quail	33878	54529	87246	-20651
Gray Squirrel	1137	604	1725	0
Horned Lark	4012	16359	22902	-12347
Least Chipmunk	37009	77289	135516	-40280
Mountain Quail	48183	66469	124176	-18286
Pine Grosbeak	773	604	1639	0
Pygmy Nuthatch	773	604	1639	0

Habitat acreage for species that are associated with the ponderosa pine PAG (brown creeper, American goldfinch, pine grosbeak, pygmy nuthatch, and gray squirrel) is within the HRV.

In general, habitat acreage for species in the juniper PAG that are strongly linked with grasses and shrubs, (least chipmunk, horned lark, California and mountain quail, bighorn sheep, and Belding's ground squirrel) is below the range of historic variability as determined by the WILDHAB model. Past overgrazing, dry land farming, seeding with non-native species, and burning changed thousands of acres of native early seral vegetation into areas dominated by non-native plant communities. Native plant species have not recovered on many of these areas. More recently fire suppression has led to juniper encroachment, which is also a later successional stage in juniper communities and is not used by the specialists linked with grasses and shrubs. These situations have affected wildlife species dependant upon native grass and shrub habitats.

3.7.2.3 Environmental Effects

3.7.2.3.1 Direct and Indirect Effects

The wildlife species dependent on the dry pine PAG (American goldfinch, brown creeper, gray squirrel, pine grosbeak, and pygmy nuthatch) would not be affected by seeding treatments or by grazing. They are dependent on large ponderosa pine trees. Habitats for these species are within HRV and would remain so for both the short (ten years) and long term (30 years) for all four alternatives.

Within the dry pine habitat types, Alternative C proposes to remove understory juniper trees on 367 acres and Alternative D proposes 86 acres of these juniper treatments. These treatments are designed to remove the competitive effects of juniper with ponderosa pine, thus encouraging the long-term persistence of the over story pine.

The brown creeper, pine grosbeak, and pygmy nuthatch have the same habitat requirements. Due to thinning in Alternatives C and D, habitat would increase from existing, but would be slightly lower than Alternatives A and B in the short term (Table 3-31). Some habitat acres would be "set back" to an earlier seral stage but the goal of treatments would be to promote larger tree growth with decreased density. Noticeable improvements in habitat from thinning juniper from pine stands would likely take longer than 30 years. Thinning the juniper would release more nutrients for the remaining pine trees. Proposed treatments would benefit wildlife species in the long term.

The gray squirrel is more of a habitat generalist than the other habitat specialists dependant upon the dry ponderosa pine PAG. These squirrels use a greater range of seral/structural stages than the other species. Therefore acres treated under Alternatives C and D would increase habitat for this species short and long term (Table 3-31).

For brown creeper, pine grosbeak, pygmy nuthatch, and gray squirrel, Alternatives A and B would provide the greatest amount of habitat, with Alternative D then C providing less, respectively. Since A and B does not propose management to "set back" any stands, there would be more, larger trees if left unmanaged.

The American goldfinch uses all seral/structural stages. Through time, although the stands change in size and structure, all acres would still be considered habitat, explaining the seemingly static habitat acreage (Table 3-31). There is no preferred alternative for this bird. Effects to habitat are identical in all alternatives.

Table 3-31 (below) displays the Historic Range of Variability, Existing Acres, and Projected Habitat Acres by Alternative for Habitat Specialists.

The habitat for all other species in this section (least chipmunk, horned lark, California and mountain quail, bighorn sheep and Belding's ground squirrel) would be affected by seeding, juniper treatment, and grazing proposals in all four alternatives.

3.7.2.3.1.1 Belding's Ground Squirrel and Horned Lark

3.7.2.3.1.1.1 Alternative A

The Belding's ground squirrel and horned lark utilize only one S/S stage (early seral grasslands). Under Alternative A, in the short term, habitat for these animals remains static (below HRV). Alternative A proposes no vegetation or grazing management. In the short term, without juniper treatments the grass and shrub stands would still be present, but existing juniper trees would continue to get larger and start expanding in range. In 30 years, most grass stands would be converted to shrublands and existing shrub stands would start converting to juniper woodlands. Under Alternative A, previously farmed and seeded lands would not become suitable habitat (as defined by this document) in the short or long term. It is expected that it would take longer than 30 years for those sites to convert back to native grass and shrub species without seeding treatments. However in that time period, habitat for early seral species would continue to decline, as more sites would be converted to juniper woodlands. Habitat for these species would decrease to 0 acres from the 4,012 acres now present (16,359 acres below HRV) in the long term, without natural disturbances (i.e. burning or grazing).

Table 3-31 Historic Range of Variability, Existing Acres, and Projected Habitat Acres by Alternative for Habitat Specialists, Crooked River National Grassland Based Upon Proposed Juniper Treatments.

Habitat Specialist	HRV	Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV

		High		Alt. A		Alt. B		Alt. C		Alt. D	
					30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
American Goldfinch	949	3122	1725	1725	1725	1725	1725	1725	1725	1725	1725
Belding's Ground Squirrel	16359	22902	4102	4012	0	4012	0	13463	2145	11100	2145
Bighorn Sheep	54701	88022	34466	23286	12105	23286	12105	31491	29192	28458	23608
Brown Creeper	604	1639	773	995	1259	995	1259	829	1250	920	1250
California Quail	54529	87246	33878	22819	11760	22819	11760	31009	28830	27983	23255
Gray Squirrel	604	1725	1137	1259	1381	1259	1381	1234	1363	1250	1327
Horned Lark	16359	22902	4012	4012	0	4012	0	13463	2145	11100	2145
Least Chipmunk	77289	135516	37009	25950	14891	25950	14891	34206	36962	31180	28554
Mountain Quail	66469	124176	48183	40712	26072	40712	26072	36808	41463	37430	35613
Pine Grosbeak	604	1639	773	995	1259	995	1259	829	1250	920	1250
Pygmy Nuthatch	604	1631	773	995	1259	995	1259	829	1250	920	1250

In Alternative A, 111,571 acres (the entire Grassland) would be closed to grazing. Table 3-32 displays cattle grazing by alternative. The lack of grazing would not increase habitat acres, but would improve habitat quality in the short term. Grass plants would be allowed to grow at an unimpeded rate and native species would possibly return to some areas sooner. There would be an increase in hiding and nesting/denning cover for many of the grass and shrub dependent species. There would also be no nest/den losses from trampling. Long term, open, bare areas would start filling in with grasses, leading to a more continuous fuel layer and possibly larger wildfires. The quality and palatability of grass forage would decrease without some form of rejuvenation (i.e. burning or grazing). For these reasons, Alternative A would improve the quality of habitat for the Belding's ground squirrel. However, for the horned lark, habitat quality would decrease. These birds prefer areas of bare ground and shorter grasses. With taller grasses they would be more vulnerable to ground predators.

A connected action to "no grazing", one hundred seventy five troughs would remain in place, but would not be filled by livestock operators, thus reducing the amount of free water for use by horned larks and Belding ground squirrels. This could be a slight negative effect to horned larks and Belding ground squirrels from this reduced water distribution. This negative effect is probably canceled by the beneficial effect of reduced direct mortality from drowning in many of these water troughs for both horned larks and Belding ground squirrels.

3.7.2.3.1.1.2 Alternative B

Alternative B proposes no juniper treatments or seeding. The effects of no vegetation management (other than livestock grazing) would be the same as under Alternative A. The effects to habitat specialists listed previously are the same as described under Alternative A.

Alternative B authorizes grazing on 102,938 acres of the Grassland. Of those acres, 95,384 acres would be grazed under a deferred rotation system and 7,554 acres under a short-duration system. Under a deferred rotation grazing system, each pasture within a grazing allotment is grazed one time per season. Each year, livestock start in a different pasture and the sequence of use is changed

or "advanced" by one pasture. Under short-duration, the pastures are grazed for shorter time periods with the probability of pasture re-entry and re-grazing later in the year.
Under a deferred rotation system neither habitat quantity nor quality is expected to increase in the short term. Hiding and nesting cover would not be expected to increase. Losses from nest/den trampling could still occur, as cattle will graze all areas of allotments on the Grassland. There would be 8,633 acres of Grassland administered land left ungrazed per year, outside of allotments, where cover would be available and there would be no nest/den trampling. Long term, it is expected that native plant species could recolonize historically seeded areas, but the time frame would be considerably longer than 30 years (assuming natural disturbances to limit juniper expansion) (Simpson, 2004). In general, these grazed areas have less dense vegetation and this vegetation does not accumulate grasses (hence fuel) as compared to ungrazed areas. Therefore the spread of large wildfires would be more limited as compared to Alternative A. Forage palatability would not be expected to decrease due to use by cattle.

Table 3-32 Authorized Cattle Grazing Management by Alternative

Cattle Grazing	ALT A		ALT B		ALT C		ALT D	
	Acres	Percent	Acres	Percent	Acres	Percent	Acres	Percent
Deferred Rotation	0	0	95,384	85	7,614	7	6,093	5
Short Duration	0	0	7,554	7	4,835	4	4,835	4
Rest Rotation	0	0	0	0	70,474	63	77,157	69
Authorized Grazing Total	0	0	102,938	92	82,923	74	88,085	78
Total Grassland Acres Analyzed	111,571	100	111,571	100	111,571	100	111,571	100
Total Acres Actually Grazed per Year	0	0	102,938	92	74,590	67	79,752	71
Ungrazed per Year	111,571	100	8,633	8	36,981	33	31,819	29
Grazed Forage Reserve	0	0	0	0	8,385	8	0	0
Grazed per Day	0	0	20,785	19	19,708	18	17,573	16
Multiple Grazing	0	0	7,554	7	4,835	4	4,835	4

These acres include allotments and areas outside of allotments but within the Grassland boundary. In addition, rotation systems are defined in the glossary.
On the 7,554 acres under a short-duration system, hiding and nesting cover would be expected to be reduced, with repeated grazing in the same year. Long-term, native plant species would not be expected to recolonize past seedings. Higher intensity grazing would tend to sustain crested wheatgrass stands and limit the amount of colonization by native plant species (Simpson 2004).

Due to the deferred rotation and short duration grazing systems proposed, the quality of nesting and hiding cover for the Belding's ground squirrel and horned lark would be expected to remain static under this alternative. In this alternative, 175 water troughs would continue to be available for

wildlife use throughout the Grassland. This may be beneficial for both species, but continued drowning mortality will also occur in some of these troughs.

3.7.2.3.1.1.3 Alternative C

Alternative C proposes approximately 49,000 acres of juniper treatments across the Grassland. Table 3-33 (below) displays acres by treatment and by alternative. There are three objectives of the proposed juniper treatments:

- Move toward HRV for wildlife species density, distribution, and composition.
- Maintain the grass or shrub stands.
- Promote larger juniper tree growth with an overall decreased stand density (in some areas).

Table 3-33 Treatment Acres by Treatment Type and Alternative

Treatment Proposal	Alternative A		Alternative B		Alternative C		Alternative D	
	Unit Acres	Treat. Acres	Unit Acres	Treat. Acres	Unit Acres	Treat. Acres *	Unit Acres	Treat. Acres *
Juniper Thinning - Chainsaw	0	0	0	0	27,095	25,092	10,803	10,088
Juniper Thinning – Chainsaw and Prescribed Burn	0	0	0	0	5,196	3,495	5,196	3,495
Juniper Thinning – Prescribed Fire	0	0	0	0	7,510	3,453	4,757	2,193
Shrub Removal – Mechanical - Mowing	0	0	0	0	488	431	488	431
Till, Seed, and Fertilize	0	0	0	0	8,344	4,289	8,344	4,289
Total Treatments	**0**	**0**	**0**	**0**	**48,633**	**36,760**	**29,588**	**20,496**

* Only portions of the units will be treated – hence ”treatment acres”.

NOTE: Unit 71 was dropped between the DEIS and FEIS. While the change in treatment acreage is reflected in the table above, these changes were not made to the species tables, which follow in this section. A change of 392 acres of treatment in L4b seral/structural stage of the western juniper PAG will not substantially change effects from what is described in this section for any wildlife species.

As mentioned before, the Belding’s ground squirrel and horned lark need early seral structure stages. This alternative decreases the amount of juniper sized 1.0 inch diameter at breast height (dbh) up to 8.9 inches dbh and increases grass and shrub stands in the short term. Most of the treatments are intended to manage many acres in an early successional stage (grass and forb dominated) and decrease western juniper’s dominance on the Grassland. Grass stands will convert to shrub stands and existing juniper trees will get larger and increase their range again over the long term, barring future disturbances (either man-made or natural). As a result there is a decrease in habitat from 10 years to 30 years for both species if the assumption that no disturbance will occur is made.

Alternative C also proposes to till, seed, and fertilize approximately 8,300 acres. These treatments would convert treated acres from unsuitable to suitable wildlife habitat over the short term. The quality and quantity of habitat on these treated acres would increase for the Belding’s ground squirrel and horned lark that both rely on native grasses. Long term, without further treatments or natural disturbances, these acres will convert to shrubland.

Through these juniper and seeding treatments, under Alternative C, habitat would increase for these two species to 13,463 acres, still below HRV, but only by 2,896 acres. Of the alternatives

analyzed, Alternative C creates the most habitat for these species. In the absence of treatment grass habitat would be expected to convert into shrub habitat, long term, therefore, decreasing available habitat to 2,145 acres. This figure is well below the HRV of 16,359 acres. Without the proposed treatments it is expected that habitat for these species would drop to 0 acres by year 30. Direct vegetation management or wildfires would be necessary every 10-30 years to ensure habitat for these species is maintained over time.

Alternative C also authorizes grazing on 82,923 acres (refer to Table 3-32 above for Acreage Grazed by Alternative). Of that area 7,614 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system, and 70,474 acres under a rest rotation system. The effects would be the same as those described under Alternative B for the acreage grazed under the deferred and short duration grazing systems. There are three major differences in Alternative C as compared to Alternative B that affect wildlife habitat. Alternative C:

- Closes four allotments (8,233 acres).
- Changes two allotments to forage reserves (11,782 acres).
- Changes 85 percent of the grazed acres to a rest rotation system.

The result of these three major differences is a significant increase in area that is left ungrazed each calendar year. Rest rotation grazing is similar to deferred rotation except that one pasture is left ungrazed each year. Under this alternative, there would be approximately 28,569 acres left ungrazed each year. Hiding and nesting cover would be expected to increase due to the increased number of ungrazed acres. Losses from nest/den trampling could still occur, but would affect 28,569 acres less than in Alternative B. In general, there would be more diversity of grass and shrub heights under Alternative C. It is expected that native plant species would begin to recolonize past seeded areas over the long term. Although the time frame for site conversion would be considerably longer than 30 years (assuming natural or man induced disturbances to limit juniper expansion), it would be expected to be approximately 20 percent faster than under a deferred rotation system (Simpson 2004). The increased risk of large wildfires would be less than Alternatives A because of the grazing removal of grasses (fine fuels) on 74,590 acres.

The grazing system in this alternative would tend to favor the horned lark over the Belding's ground squirrel due to the percentage of the Grassland being grazed. However, with rest pastures scattered throughout the Grassland, a mosaic of habitats is expected for both species.

In this alternative, 175 water troughs would continue to be available for wildlife use throughout the Grassland. This may be beneficial for both species. Drowning mortality will continue to occur in many of the troughs. There are currently no permanent water troughs in the allotments proposed for closure.

Under this alternative, seventeen miles of new fence would have a slight negative effect on the horned lark. A few horned larks could be killed through collisions with the newly constructed fences. There would be no effects to the Belding's ground squirrel from this fence.

3.7.2.3.1.1.4 Alternative D

Alternative D proposes approximately 21,000 acres of juniper treatments across the Grassland. Table 3-33, displays acres by treatment by alternative. The objectives of the proposed juniper treatments are the same as in Alternative C. The effects to wildlife habitat are also similar to those described under Alternative C. In this alternative, fewer acres would be converted to the early seral/structural grass and shrub stages. In the long term, this alternative does not create as much suitable habitat for the Belding's ground squirrel and horned lark as Alternative C, but more than Alternatives A and B. Habitat acreage for these species would increase to 11,100 acres in the short term, slightly less than C, but 7,088 acres more than Alternatives A and B. Habitat would remain under the amount that historically occurred (HRV) on the Grassland.

In Alternative D, the seeding proposals and effects to these species are identical to those described under Alternative C.

Alternative D also authorizes grazing on 88,085 acres (Table 3-32). Of those acres 6,093 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system and 77,157 under a rest rotation grazing system. For the acres grazed under the deferred and short duration grazing systems, the effects would be the same as under Alternative B. There are two major differences between Alternative C and Alternative D that affect wildlife habitat. Alternative D:

- Closes five allotments and decreasing the size of one (13,261 acres).
- Changes 88 percent of the grazed acres to a rest rotation system.

Effects of Alternative D are very similar to Alternative C. Under this alternative, there would be 31,819 acres left ungrazed each year, 3,250 more ungrazed acres than Alternative C. Hiding and nesting cover would be expected to increase even more, due to the increased number of ungrazed acres. Losses from nest/den trampling could still occur but would be much less than in Alternatives B and slightly less than Alternative C. Long term, through this alternative native plant species would be expected to increase at the same rate as in Alternative C. The increased risk of large wildfires would be less than Alternative A, but higher than Alternatives B and C. This alternative would tend to favor habitat for the Belding's ground squirrel over the horned lark due to the increased acreage left ungrazed.

In this alternative, 175 water troughs would continue to be available for wildlife use throughout the Grassland. This may be beneficial to both species, but the benefit could be off-set by continued drowning of individuals. Under this alternative, seventeen miles of new fence would have a negative effect on most habitat specialists. A few horned larks could be killed through collisions with the newly constructed fences. There would be no effects to the Belding's ground squirrel from this fence. Currently, there are no permanent water troughs in the allotments proposed for closure.

3.7.2.3.1.1.5 Ranking

Alternative D would be the best for the Belding's ground squirrel, followed by C, A, then B. This is because of the increased habitat quantity over the short term from juniper and seeding treatments, as well as the increase of habitat quality associated with decreased grazing.

Alternative C would be the best for the horned lark, followed by D, B, then A. This is because of increased habitat quantity over the short-term juniper and seeding treatments, as well as the increase of habitat quality associated with grazing.

3.7.2.3.1.2 Bighorn Sheep and California Quail

Habitats for the bighorn sheep and California quail are very similar in that both species prefer grass and shrub communities but will tolerate widely spaced trees. The difference in acreage is because bighorn sheep will use early seral stages in ponderosa pine, where the California quail generally does not in natural situations (not being attracted to bird feeders, etc.). The effects to these animals are the same even though the habitat numbers are slightly different (Table 3-31).

3.7.2.3.1.2.1 Alternative A

Under Alternative A habitat for these animals decreases (Table 3-31) over the short and long terms. General effects of this alternative are the same as for the Belding's ground squirrel and horned lark. At this time there are no bighorn sheep on the District, but there are plans for reintroduction of this species in the areas adjacent to Lake Billy Chinook and immediately upstream in the Deschutes and

Crooked River Canyons. Both species would benefit from the removal of grazing proposed in this alternative for several reasons, including increased cover for quail, decreased disease transmission for bighorns, increased re-colonization of native plants and decreased competition for forage for both species.

3.7.2.3.1.2.2 Alternative B

There are no vegetation management proposals in Alternative B. The effects of the lack of vegetation management to these animals are the same as Alternative A.

Alternative B proposes grazing on 102,938 acres. The effects of grazing in this alternative, on bighorn sheep and California quail, are the same as those described for the Belding's ground squirrel and horned lark. Additional effects specific to bighorn sheep from grazing include forage competition and disease transmission from domestic sheep. Again, at this time there are no bighorn sheep on the District, but there are plans for their reintroduction. The Oregon Department of Fish and Wildlife has determined that domestic sheep grazing within seven miles of a bighorn herd is close enough to transmit diseases (Ardt 2003). A successful bighorn sheep reintroduction would not be attempted with domestic sheep grazing on the west side of the Grassland, in either the Lower Desert Allotment.

3.7.2.3.1.2.3 Alternative C

Under Alternative C habitat would decrease slightly for these two species because successional advancement of juniper (juniper seedlings establish and growing in grass and shrub dominated vegetation) will occur at a rate faster than the juniper and seeding treatments will maintain and revert acres into early successional habitats. The amounts of sheep and quail habitats are currently below HRV and are projected to stay that way (Table 3-31). General effects of this alternative are the same as for the Belding's ground squirrel. Although below HRV, this alternative creates the most habitat for these species over the short and long term. Over the long term, in the absence of either natural or man-made disturbance, succession would continue converting the grass, shrub, and small tree habitat to juniper woodlands, therefore decreasing available habitat further. The 30-year habitat acreage estimates for the bighorn sheep and California quail are well below their respective HRVs, however, compared to Alternatives A and B where there is no proposed vegetation management, habitat acreage is projected to drop by at least 17,000 less acres. Direct vegetation management or wildfires would be necessary every 10-30 years to maintain or improve habitat for these species over time.

The changes in grazing management in Alternative C would also improve the quality of habitat for both species. Again, the effects of grazing in this alternative are the same as for the Belding's ground squirrel. However, the creation of a forage reserve for domestic sheep grazing at Canadian Bench or Lower Desert would eliminate the potential to reintroduce bighorn sheep. Canadian Bench is within range for possible disease transmission from domestic sheep to potentially reintroduced bighorn sheep.

3.7.2.3.1.2.4 Alternative D

Alternative D is very similar in effects to Alternative C above. This alternative proposes less juniper treatment than Alternative C. Habitat for the bighorn sheep and California quail would decrease more than described under Alternative C but not as much as in Alternatives A and B. The seeding proposals and associated effects are the same as described in Alternative C (Table 3-31).

Grazing regimes in Alternative D are also similar to Alternative C. Effects on habitat for these species would be the same as for the Belding's ground squirrel under Alternative D. In this alternative there would be no domestic sheep grazing on the west side of the Grassland, therefore, there would be no grazing associated conflicts with a possible bighorn sheep reintroduction.

3.7.2.3.1.2.5 Ranking

Alternative D would be the best for the bighorn sheep, followed by Alternatives A, B, then C. This is because, primarily, of eliminated conflicts between bighorn sheep (potential reintroduction) and domestic sheep grazing. Additional reasons Alternative D is beneficial to bighorn sheep is because of the increased habitat quantity, over the long term, from juniper and seeding treatments, as well as increased habitat quality associated with decreased grazing as compared with the current situation.

Alternative C would be the best for the California quail, followed by Alternatives D, A, then B. This is because of increased habitat quantity, over the long term, from a greater amount of juniper and seeding treatments, as well as increased habitat quality associated with decreased grazing.

3.7.2.3.1.3 Least Chipmunk and Mountain Quail

Habitat for the least chipmunk and mountain quail is very similar in that they both prefer open areas with either grasses or shrubs, or open grown large trees with a shrub understory. The difference in habitat acreage is because the mountain quail will use a wider range of seral stages in ponderosa pine PAGs than the least chipmunk. The effects to both of these animals are the same even though the habitat acreage numbers are slightly different (Table 3-31).

3.7.2.3.1.3.1 Alternative A

Habitat for these animals decreases (below HRV) under Alternative A, over the short and long term. The general effects of this alternative are the same as for the Belding's ground squirrel. An additional effect is that juniper woodlands would continue to grow eventually providing closed canopy conditions, which are unsuitable for these species.

In Alternative A, a lack of grazing would improve the quality of habitat for the least chipmunk and mountain quail.

3.7.2.3.1.3.2 Alternative B

There are no vegetation management proposals in Alternative B. The effects to these animals are the same as those described under Alternative A above.

Again, under Alternative B the general effects of grazing are the same as for the Belding's ground squirrel.

3.7.2.3.1.3.3 Alternative C

In Alternative C, habitat would decrease slightly for the least chipmunk and mountain quail in the short term. The habitat is currently below HRV and will stay that way (Table 3-31). Again, this alternative provides similar effects as for the Belding's ground squirrel. In the long term, under this alternative, habitat for these species is projected to increase and would attain the highest level of all of the alternatives analyzed. These species' response to the alternative differ from the Belding ground squirrel's in that the least chipmunk and mountain quail will also use large open stands of conifers. Many of the treatments proposed thin juniper stands and reduce tree density, which results in faster and larger tree growth. The habitat acreage for these species reflects the response to this woodland thinning as well as the conversion to grass and shrub stands.

The changes in grazing management in Alternative C would also be expected to improve the quality of habitat for the least chipmunk and mountain quail as compared to the present situation on the Grassland. Again, effects of grazing and associated management in this alternative are the same as those for the Belding's ground squirrel.

3.7.2.3.1.3.4 Alternative D

Alternative D is very similar in effects to Alternative C above. This alternative proposes less juniper treatment than Alternative C (Table 3-31). Habitat for the least chipmunk and mountain quail would decrease in the short term more than Alternative C but not as much as in Alternatives A and B (Table 3-31). The seeding proposals and associated effects are the same as those described under Alternative C. Long term, habitat acreage for both species moves closer to HRV but still would attain approximately 6,000 acres less than anticipated under Alternative C. Under Alternative D the effects on least chipmunk and mountain quail habitat from grazing would be the same as those described for the Belding's ground squirrel under the same alternative.

3.7.2.3.1.3.5 Ranking

Alternative C would be the best for the least chipmunk and mountain quail, followed by Alternatives D, A, then B. This is because of the long-term increase in habitat quantity from juniper and seeding treatments as well as increased habitat quality associated with decreased grazing as compared to the present situation.

3.7.2.3.2 Cumulative Effects

Please see the end of the wildlife section for cumulative habitat effects (Section 3.7.8) of the various past present and reasonably foreseeable future actions for all wildlife species occurring on the Grassland.

3.7.2.4 Forest Plan Consistency

There are no goals, objectives, desired future conditions, or standards and guidelines specifically for habitat specialists in the LRMP.

3.7.3 Neotropical Migratory Birds (Focal Species)

3.7.3.1 Current Management Direction (LRMP, FSM, etc.)

3.7.3.1.1 Forest Plan Management Direction … (including migratory birds): (LRMP pg. 4-122)

- "Provide diversity by maintaining representative portions of all native plant associations and various successional stages represented in an area through time."

3.7.3.1.2 Forest Plan Desired Future Condition: (LRMP pg. 4-19)

- "Populations of animal species, including upland game birds, doves, bluebirds and other songbirds…are expected to increase substantially as vegetation conditions in riparian areas and elsewhere improve, and as brush planted for winter cover and hiding cover matures."

3.7.3.2 Affected Environment

The Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington (LCS) was prepared in 2000 by Altman and Holmes for Oregon-Washington Partners-In-Flight to "take an active approach to conservation of land birds in the Columbia Plateau of eastern Oregon and Washington."

According to the LCS, there are 23 focal species assumed to be found on the Grassland. These species were selected based on their conservation need or their degree of association with important habitat types historically occurring on the Grassland. Table 3-34 (below) displays the focal species and associated habitats (see LCS 2000).

Table 3-34 Columbia Plateau Focal Species and Their Associated Habitats.

Focal Species	Habitat	Habitat Attribute
Grasshopper sparrow	Steppe	Native bunchgrass cover
Loggerhead shrike	Steppe-Shrubland	Interspersion tall shrubs – openings
Burrowing owl	Steppe-Shrubland	Burrows
Sharp-tailed grouse	Steppe-Shrubland	Deciduous shrubs and trees
Greater Sage grouse	Sagebrush	Large areas – diverse understory
Sage sparrow	Sagebrush	Large contiguous patches
Brewer's sparrow	Sagebrush	Sagebrush cover
Sage thrasher	Sagebrush	Sagebrush height
Lark sparrow	Shrublands	Ecotone edges
Black-throated sparrow	Shrublands	Sparsely vegetated desert scrub
Ferruginous hawk	Juniper-Steppe	Scattered mature trees
Lewis' woodpecker	Riparian Woodland	Large snags (cottonwood)
Bullock's oriole	Riparian Woodland	Large canopy trees (cottonwood)
Yellow warbler	Riparian Woodland	Subcanopy foliage
Yellow-breasted chat	Riparian Woodland	Dense shrub layer
Yellow-billed cuckoo	Riparian Woodland	Large, structurally diverse patches
Willow flycatcher	Riparian Shrub	Dense shrub patches
Lazuli bunting	Riparian Shrub	Shrub-herbaceous interspersion
Red-naped sapsucker	Aspen	Large trees/snags with regeneration
Bobolink	Agricultural Fields	Mesic conditions
Gray flycatcher	Juniper Woodland	Mature trees with regeneration
Prairie falcon	Cliffs and Rimrock	Undeveloped foraging areas
Virginia's warbler	Mountain Mahogany	Large trees with regeneration

There are no known sightings or habitat on the Grassland for the Virginia's warbler, grasshopper sparrow, bobolink, or the yellow-billed cuckoo.

The yellow-billed cuckoo likely existed on the Grassland when large cottonwood stands were present in perennial stream drainages. These stands no longer exist.

WILDHAB evaluates upland areas, not riparian, meadow, or lake environments. Habitat for riparian species such as the lazuli bunting, yellow warbler, yellow breasted chat, Bullock's oriole, willow flycatcher, and red-naped sapsucker is rare on the Grassland. There are small areas of cottonwood and aspen but not of adequate size to sustain large populations of riparian dependent species. Neotropical migratory bird surveys completed in 2004 however, found that the slopes above Squaw Creek support one of the highest concentrations of lazuli buntings known in Central Oregon.

On the Grassland, riparian areas include: Haystack Reservoir, Lake Billy Chinook, the Deschutes and Crooked Rivers, Squaw, Willow, Lone Pine, and Mud Springs Creeks, and the Rimrock Springs Wildlife Management Area.

Over 90 percent of the riparian areas on the Grassland are currently fenced to exclude grazing. There are two riparian pastures but they are only grazed on an as needed basis. They are recovering from historical heavy use but have not returned to historic conditions.
Losses of riparian habitats on the Grassland are associated with past: overgrazing, farming, and rerouting of streams for irrigation.

The gray flycatcher and the greater sage grouse will be discussed under Proposed, Endangered, Threatened, and Sensitive (PETS) species (Section XXXXX). The burrowing owl, ferruginous

hawk, and prairie falcon will be discussed under Raptors (Chapter 3, Section 3.7.4). They will not be discussed here.

Table 3-35 (below) displays the estimated acreage of existing habitat, the HRV of those habitat acreages, and the difference between the two for the remaining eight focal species known to occur on the Grassland.

Table 3-35 Existing Habitat and HRV for Focal Species, Crooked River National Grassland

Focal Species	Existing	HRV		Comparison to HRV
	Acres	Low Acres	High Acres	Acres over (+), Under (-) or Within (0)
Sharp-tailed Grouse	33878	54529	87246	-20651
Loggerhead Shrike	31942	59981	110148	-28039
Black-throated Sparrow	33878	54529	87246	-20651
Brewer's Sparrow	46775	65434	121053	-18659
Lark Sparrow	46521	65434	121053	-18913
Sage Sparrow	29866	38170	64344	-8304
Sage Thrasher	29866	38170	64344	-8304
Lewis' Woodpecker	710	863	2036	-153

Habitat acreage for the loggerhead shrike and Lewis' woodpecker are below HRV. These species rely on large juniper trees. WILDHAB estimated very few acres in the late seral stage categories on the Grassland. Historically, there were relatively few large trees on the Grassland. Settlers seeking wood for homes and other structures removed what large trees were present.

Although habitat acreage for loggerhead shrikes is below HRV, there are healthy populations of shrikes and they are on the increase on the Grassland. Apparently this is due to the fact that they have adapted to changing conditions. They have been found nesting in "Christmas tree sized juniper" that are taking the place of tall shrubs, one of their traditional nest sites. Shrikes will still nest in large juniper trees, but seem to be utilizing the small trees more on the Grassland (Gerhart 2002).

Habitat acreages for the rest of the focal species (sharp-tailed grouse, black-throated sparrow, brewer's sparrow, lark sparrow, sage sparrow, and sage thrasher) are also below HRV. Many of these birds are tied to native grasses/sagebrush and although there are grasses and shrubs in many areas of the Grassland, they are generally non-native species. Again, these non-native dominated PAGs provide unsuitable habitat for these birds.

3.7.3.3 Environmental Effects

3.7.3.3.1 Direct and Indirect Effects

Table 3-36 (below) displays the focal species, their existing habitat acreages, the habitat acreage, HRV, and the projected habitat acreages by alternative. All acreage figures were generated through the WILDHAB model.

Table 3-36 Historic Range of Variability, Existing Habitat, and Projected Habitat Acres by Alternative for Focal Species, Crooked River National Grasslands.

Focal Species	HRV	Existing Acres	Post Treatment Acres of Habitat – below, above , within - HRV

		High		Alt. A		Alt. B		Alt. C		Alt. D	
					30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Black-throated Sparrow	54529	87246	33878	22819	11760	22819	11760	31009	28830	27983	23255
Brewer's Sparrow	65434	121053	46521	39232	24895	39232	24895	35202	40278	35915	34428
Lark Sparrow	65434	121053	46521	39232	24895	39232	24895	35202	40278	35915	34428
Lewis' Woodpecker	863	2036	710	710	710	710	710	710	710	710	710
Loggerhead Shrike	59981	110148	31942	20883	13836	20883	13836	19671	33926	19008	25527
Sage Sparrow	38170	64344	29866	18807	11760	18807	11760	17546	26685	16883	21110
Sage Thrasher	38170	64344	29866	18807	11760	18807	11760	17546	26685	16883	21110
Sharp-tailed Grouse	54529	87246	33878	22819	11760	22819	11760	31009	28830	27983	23255

3.7.3.3.1.1 Black-throated Sparrow and Sharp-tailed Grouse

The effects on habitat from all treatments in all alternatives for the black-throated sparrow and the sharp-tailed grouse would be identical to those for the greater sage grouse (Section XXXXX). Presently the habitat acreage is below HRV and would remain so under all alternatives (Table 3-36).

Under Alternatives C and D, seventeen miles of new fence would have a slight negative effect on these focal species. While it is not as common as for the larger birds such as raptors, smaller birds can become entangled in fences or strike fences during flight thus risking injury or death.

3.7.3.3.1.1.1 Ranking

Alternative C would be the best for the black-throated sparrow and the sharp-tailed grouse, followed by Alternatives D, A, then B. This is because of increased habitat quantity over the long term from juniper and seeding treatments as well as increased habitat quality associated with decreased grazing as compared to the present situation.

3.7.3.3.1.2 Brewer's and Lark Sparrows

The Brewer's and lark sparrows utilize all of the open structural stages in the juniper PAG except for pure grasslands. They are strongly associated with sagebrush. The effects of the juniper and seeding treatments to habitat for these two birds species is identical (Table 3-36).

3.7.3.3.1.2.1 Alternative A

Under Alternative A, short-term habitat decreases from 46,521 acres to 39,232 acres are associated with an absence of juniper management or seeding. This is due to the succession of young, open juniper stands into closed canopy stands, which represents unsuitable habitat for these birds. Suitable habitat acreage decreases further due to long term conversion of additional juniper acreage to closed canopy conditions.

Although habitat quantity does not increase in association with the elimination of grazing, habitat quality for both birds does increase. The Brewer's sparrow prefers areas with more hiding and nesting cover while the lark sparrow seems to prefer grazed areas (LCS 2000).

Alternative A removes all grazing from the Grassland. Because of this, native bunchgrass plants would be allowed to recover at an unimpeded rate, possibly returning to some areas sooner. There

would be an associated increase in hiding and nesting cover and the elimination of nest losses from domestic livestock trampling. Over the long term, open, bare areas would start filling in with grasses. A more continuous fuel layer could lead to larger wildfires. For these reasons, Alternative A would improve the quality of habitat for the Brewer's sparrow. However, for the lark sparrow, habitat quality would decrease. These birds prefer areas of bare ground and shorter grasses. Taller grass height associated with this alternative would make this species more vulnerable to predators.

A connected action to "no grazing", one hundred seventy five troughs would remain in place, but would not be filled by livestock operators, thus reducing the amount of free water for use by Brewer's and lark sparrows. There could be a slight negative effect to Brewer's and lark sparrows from this reduced water distribution. This negative effect is probably canceled by the beneficial effect of reduced direct mortality from drowning in many of these water troughs for both Brewer's and lark sparrows.

3.7.3.3.1.2.2 Alternative B

Alternative B proposes no vegetation management. There would be no juniper thinning or reseeding efforts. The effects of no vegetation management would be the same as those described under Alternative A.

The effects to the Brewer's and lark sparrows from the grazing proposed in Alternative B would be the same as those described for the Belding's ground squirrel and horned lark.

3.7.3.3.1.2.3 Alternatives C and D

Juniper and seeding treatments proposed in Alternatives C and D would result in a short-term decrease in habitat acreage for both birds (Table 3-36). Some of the juniper treatment proposals convert shrub or young juniper stands to early seral grasslands because of the additional use of fire, either alone or in conjunction with mechanical thinning. These types of treatments would result in unsuitable habitat for these birds. In the long term (within 30 years), however, grass stands will convert to shrub stands and existing juniper trees will get larger and increase habitat for the Brewer's and lark sparrows.

Under Alternatives C and D, seventeen miles of new fence would have a slight negative effect on these neotropical migratory bird species. While it is not as common as for the larger birds such as raptors, smaller birds can become entangled in or fly into fences, risking injury or death.

3.7.3.3.1.2.4 Ranking

Alternative C would be the best for the Brewer's and lark sparrows, followed by Alternatives D, A, then B. This is because of a long-term increase in habitat quantity from juniper and seeding treatments as well as increased habitat quality associated with decreased grazing.

3.7.3.3.1.3 Lewis' Woodpecker

Habitat for the Lewis' woodpecker would remain below HRV in the short through long term under all alternatives (Table 3-36). None of the alternatives provide a change in habitat acreage; which remains at 710 acres (153 acres below HRV). This bird species requires large tree stands with an open canopy in ponderosa pine (E4b, E5b, M4b, L4b, L5b). There are no treatments proposed in any of the alternatives that would create this type of habitat. Habitat acreages are static short through long term because open conditions in pine are not created by succession, but by either management or natural disturbances. Succession in ponderosa pine stands creates closed canopy conditions, which is not suitable for this species. Without management (again none is proposed) or a natural disturbance to thin these closed canopy stands no additional habitat will be created in the short or long term.

The Lewis woodpecker would not be affected by seeding treatments or by grazing. They are dependent on large trees for nesting and insect populations associated with the tree canopy for foraging.

Under Alternatives C and D however, seventeen miles of new fence would have a slight negative effect on this bird species. While it is not as common as for the larger birds such as raptors, smaller birds can become entangled in or fly into fences, risking injury or death.

3.7.3.3.1.3.1 Ranking

There is no preferred alternative for the Lewis' woodpecker. Effects to habitat are identical in all alternatives.

3.7.3.3.1.4 Loggerhead Shrike

Habitat for loggerhead shrikes would remain below HRV under all alternatives (Table 3-36). These birds prefer shrub stands and open canopy juniper stands with both small and large trees.

3.7.3.3.1.4.1 Alternative A

Under Alternative A, a short-term decrease in habitat is expected as small tree stands grow larger and denser. Over the long term, shrub stands would convert to small tree stands and the small tree stands would again grow larger and denser. Open canopy conditions are not created by direct successional pathways, but by either management induced or natural disturbances that thin these stands from below. Habitat would continue to decrease to 13,836 acres over the next 30 years, which is 46,145 acres below habitat HRV acreage (Table 3-36).

A lack of grazing would result in a short-term increase in vegetative structure necessary for nesting and roosting. Long term, open, bare areas would start filling in with grasses, leading to a more continuous fuel layer and possibly larger, more intense wildfires. Treeless areas are important foraging areas for young shrikes (LCS 2000).

3.7.3.3.1.4.2 Alternative B

There are no vegetation management proposals included under Alternative B, the effects of which on the loggerhead shrike are the same as in Alternative A above.

Due to the deferred rotation and short duration grazing systems proposed for continuance under Alternative B (Table 3-32), the quality of nesting and roosting habitat for the loggerhead shrike would be expected to remain static. Long-term heavy grazing may ultimately reduce prey habitat and degrade the vegetative structure for nesting and roosting (LCS 2000). This alternative would, however, maintain open foraging sites for young birds.

3.7.3.3.1.4.3 Alternative C

The juniper and seeding treatments proposed in Alternative C (Table 3-33) would decrease habitat in the short term to 19,671 acres (Table 3-33). Many of the small tree stands would be converted to grasslands, which is unsuitable habitat for this bird. Long term, however, this alternative creates the most loggerhead shrike habitat (33,926 acres) of the alternatives analyzed. Most of the created grasslands would eventually be converted to shrublands. In addition, some of the juniper treatments would thin closed canopy stands creating open stands suitable for these birds.
The changes in grazing (Table 3-32) under this alternative would greatly benefit loggerhead shrikes. Grazing effects to this bird would be similar to the Belding's ground squirrel. Light to moderate grazing could improve open foraging habitat for the young birds while areas closed to grazing would improve adult nesting and roosting habitat. Effects of large wildfires would be greatly reduced in this alternative due to the grazing and juniper treatments.

Under this alternative, seventeen miles of new fence would have a slight positive effect on this bird species. Shrikes seem to have adapted positively to barbed wire fences and frequently use these structures for perching to forage from and frequently shrikes are seem impaling their prey on these fences. This habit had gained the bird the nickname of "butcher bird".

3.7.3.3.1.4.4 Alternative D

The effects on loggerhead shrike habitat of juniper treatments, seeding proposals, and grazing under Alternative D (Tables 3-32 and 3-33) are very similar to Alternative C above. The juniper and seeding treatments would create less habitat long and short term than Alternative C because the amount of juniper treatment proposed under Alternative D is much less than Alternative C (Table 3-36).

Reduced grazing within loggerhead shrike habitat, under Alternative C, would improve the quality of nesting and roosting habitat for adult birds better than in Alternative D (Table 3-36).

Under this alternative, seventeen miles of new fence would also have a slight positive effect on this bird species. Shrikes seem to have adapted positively to barbed wire fences and frequently use these structures for perching to forage from and frequently shrikes are seem impaling their prey on these fences. This habit had gained the bird the nickname of "butcher bird".

3.7.3.3.1.4.5 Ranking

Alternative C would be the best for the loggerhead shrike, followed by Alternatives D, A, then B. This is because of the short and long term increase in habitat quantity from juniper and seeding treatments as well as the creation of the mosaic of adult and young bird habitat associated with the grazing systems employed.

3.7.3.3.1.5 Sage Sparrow and Sage Thrasher

The effects on habitat from all alternatives for the sage sparrow and the sage thrasher would be identical to those for the pygmy rabbit (Section XXXXX). Presently habitat for these species is below HRV and would remain so under all alternatives (Table 3-36).

Under Alternatives C and D, seventeen miles of new fence would have a slight negative effect on these neotropical migratory bird species. While it is not as common as for the larger birds such as raptors, smaller birds can become entangled in fences or fly into fences, risking injury or death.

3.7.3.3.1.5.1 Ranking

Alternative C would be the best for these birds, followed by Alternatives D, A, then B. This is because of the long-term increase in habitat quantity from juniper and seeding treatments as well as the increased habitat quality associated with decreased grazing.

3.7.3.3.2 Cumulative Effects

Please see the end of the wildlife section for cumulative habitat effects (Section 3.7.8) of the various past present and reasonably foreseeable future actions for all wildlife species occurring on the Grassland.

3.7.3.4 Forest Plan Consistency

Table 3-37 compares LRMP consistency with goals and desired future conditions by alternatives.

Table 3-37 Goals, Desired Future Conditions, and Consistencies by Alternative for Neotropical Migratory Birds.

Neotropical Migratory Birds Goals and Desired Future Conditions	Alternative A Consistency	Alternative B Consistency	Alternative C Consistency	Alternative D Consistency
Provide diversity by maintaining representative portions of all native plant associations and various successional stages represented in an area through time.	Yes*	Yes*	Yes	Yes
Populations of animal species, including upland game birds, doves, bluebirds, and other songbirds…are expected to increase substantially as vegetation conditions in riparian areas and elsewhere improve, and as brush planted for winter cover and hiding cover matures.	Yes*	Yes*	Yes	Yes

* Inaction (e.g. not controlling juniper expansion) does not constitute a violation of Forest Plan standards and guidelines. LRMP inconsistencies are constituted by Federal actions.

3.7.4 Raptors (Eagles, Owls, Hawks, and Falcons)

3.7.4.1 Current Management Direction (LRMP, FSM, etc.)

3.7.4.1.1 Forest Plan Management Direction for Raptors: (LRMP 1989 pg. 4-121,122)

- Protect active raptor nests from human disturbances until nesting, feeding, and fledging are completed. Provide protection of nest sites and nesting habitat sufficient for the species involved.
- Protect bald and golden eagle nesting and roosting sites as prescribed in the "Act for Protection of Bald and Golden Eagles" (Title 50 CFR, USC 668-668d).
- Protect hawk, falcon and owl nesting and roosting sites.

3.7.4.2 Affected Environment

There is a large raptor population on the Grassland including bald and golden eagles, many varieties of hawks, several owl species, and a few falcon species. Burrowing owls were historically on the Grassland but have not been found since 1992. The bald eagle is discussed in Chapter 3, Section 3.8.4.1.1 the PETS section.

A raptor/raven nest inventory completed in 1992 totaled 395 nests across the Grassland, with 164 being active in that year. It also identified the last known active burrowing owl nests on the Grassland.

Raptor species nesting on the Grassland include: golden eagle, bald eagle, osprey, turkey vulture, red-tailed hawk, northern harrier, Swainson's hawk, Cooper's hawk, prairie falcon, kestrel, great horned owl, long eared owl, barn owl, and burrowing owl (Clowers, 1992).

Twelve of 25 known golden eagle nests on the west side of the Grassland were occupied during the spring of 2002 (Marheine, 2002). Five nests on the east side of the Grassland were occupied in 2003.

Table 3-38 (below) displays the habitat information projected through WILDHAB analyses.

Table 3-38 Existing Habitat and HRV for Raptors, Crooked River National Grassland.

Raptor Species	Existing	HRV	Comparison to HRV

	Acres	Low Acres	High Acres	Acres over (+), under (-) or within (0)
Flammulated Owl	1137	776	2243	0
Northern Goshawk	773	604	1639	0
Burrowing Owl	4012	16359	22902	-12347
Ferruginous Hawk	34466	54615	87763	-20149
Golden Eagle	773	6057	14726	-5284
Prairie Falcon	34223	54615	87763	-20392
Western Screech Owl	16909	27437	57158	-10528

Habitat acreages for raptors that live in the ponderosa pine PAG (flammulated owl and northern goshawk) are within HRV (Table 3-38). These birds utilize large trees for nesting and roosting. The flammulated owl prefers open forests while the goshawk utilizes both open and closed forest types.

The burrowing owl (also a focal species) is deficient in habitat acreage (relative to HRV, Table 3-38) on the Grassland. They utilize the earliest seral/structural status/stage (grasses and forbs) for their habitat. They are ground nesters and avoid predators by spotting them and escaping into their dens. There is a lack of pure grass stands on the Grassland. This species also relies on badgers and yellow-bellied marmots to create burrows. Burrowing owls nest in dens abandoned by these animals. A spring 2002 survey of historic nest sites was completed, but no burrowing owls have been seen on the Grassland since 1992. The badger, marmot, and ground squirrel populations have decreased on the Grassland. Ground squirrels are the primary prey for badgers. Without ground squirrels, there are no badgers, and without badgers, there will be no burrowing owl nest sites. The lack of suitable habitat and recreational shooting of ground squirrels and marmots are the two primary reasons for the local decline of burrowing owls (Carey, 2002).

Habitat acreages for the ferruginous hawk and prairie falcon (both also focal species) are below HRV (Table 3-38). Both of these species prefer open grassland or shrubland habitats (LCS). Within these habitats the ferruginous hawk utilizes scattered large juniper trees for nesting while the prairie falcon utilizes cliff faces.

Habitat conversions to agricultural areas or successional advancement to juniper woodlands have removed habitat for these species. Control programs and recreational shooting of prey populations have also caused a decrease in these populations across their range (LCS 2000).

The golden eagle utilizes large trees within both the pine and juniper PAGs for nesting and roosting. Habitat acreage for this eagle is below HRV on the Grassland (Table 3-38). Nest and roost trees are lacking due to past harvest by homesteaders (Holtzapple 2003). Pine Ridge, Willow Creek, and Gray Butte are the only areas east of the Deschutes River with scattered ponderosa pine. Eagles on the Grassland also nest on cliff faces and forage in the upland grass and shrublands.

The western screech owl is a smaller bird and therefore, can utilize trees down to 12 inches dbh (Thomas 1979). Habitat acreage for this bird is also below HRV (Table 3-38). This is due to the deficit in large juniper trees. The Grassland is below HRV for size class 4 (9-20.9 inches dbh) by over 14,000 acres and below in size class 5 (21 inches dbh and larger) by 259 acres. Again, nest and roost trees are lacking due to past harvest by homesteaders (Holtzapple 2003).

A contributing factor to the decline in all raptor populations is the decreasing prey base, predominately ground squirrels and jackrabbits. Poor habitat conditions, recreational shooting, harassment, and OHV traffic are some of the reasons for declines in these prey populations.

3.7.4.3 Environmental Effects

3.7.4.3.1 Direct and Indirect Effects

Table 3-39 below displays HRV of habitat acreage, existing habitat acreage, and projected habitat acreage for raptors.

Table 3-39 Historic Range of Variability, Existing Habitat, and Projected Habitat Acres by Alternative for Raptors, Crooked River National Grassland.

Raptor Species	HRV		Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV							
	Low	High		Alt. A		Alt. B		Alt. C		Alt. D	
				10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Flammulated Owl	776	2243	1137	1259	1381	1259	1381	1243	1363	1250	1372
Northern Goshawk	604	1639	773	955	1259	955	1259	829	1250	920	1250
Burrowing Owl	16359	22902	4012	4012	0	4012	0	13463	2145	11100	2145
Prairie Falcon	54615	87736	34223	23164	12105	23164	12105	31371	29011	28345	23427
Ferruginous Hawk	54615	87763	34466	23286	12105	23286	12105	31491	29192	28458	23608
Golden Eagle	6057	14726	773	955	3335	955	3335	829	3375	920	3375
Western Screech Owl	27437	57158	16909	27968	39027	27968	39027	21924	28276	24950	33851

3.7.4.3.1.1 Flammulated Owl and Northern Goshawk

The effects of all alternatives to the flammulated owl and northern goshawk habitat are identical to the effects to bald eagle reproductive habitat (Section 3.8.4.2.1.1). Habitat for these species would not be affected by seeding treatments or by grazing, but would be associated with juniper treatments (Table 3-39).

Under Alternatives C and D, seventeen miles of new fence would have a negative effect on the Grassland raptor species. These large birds can easily become entangled in fences, usually leading to death.

3.7.4.3.1.1.1 Ranking

Alternatives A and B are best for flammulated owl and northern goshawk habitat, followed by Alternatives C and D. This is because of the increased number of larger trees remaining under Alternatives A and B. Grazing does not affect these birds.

3.7.4.3.1.2 Burrowing Owl

Habitat figures (Table 3-39) and effects of the alternatives for the burrowing owl habitat are identical to those for horned lark habitat (Chapter 3, Section 3.7.2.3.1.1). Burrowing owl habitat acreage is below HRV under all alternatives.
None of the proposed fencing under Alternatives C and D is within potential burrowing owl habitat. There would be no effects to this species' habitat.

3.7.4.3.1.2.1 Ranking

Alternative C would be the best for the burrowing owl, followed by Alternatives D, B, then A. This is because of the short through long term increase in habitat quantity from juniper and seeding treatments as well as increased habitat quality associated with grazing management.

3.7.4.3.1.3 Ferruginous Hawk and Prairie Falcon

Habitat acreage for the ferruginous hawk and prairie falcon is below HRV under all alternatives (Table 3-39). Although the habitat acreage numbers are slightly different between these species, the effects their habitats are the same. Effects to their habitats are the same as those described for the California quail (Chapter 3, Section 3.7.2.3.1.2). In this case, the increased cover variable is associated with their prey habitat needs.

Under Alternatives C and D, seventeen miles of new fence would have a negative effect on these raptor species. These large birds can easily become entangled in fences, usually leading to death.

3.7.4.3.1.3.1 Ranking

Alternative D would be the best for the ferruginous hawk and prairie falcon, followed by Alternatives C, A, then B. This is because of the long-term increase in habitat quantity from juniper and seeding treatments and increased habitat quality associated with decreased grazing.

3.7.4.3.1.4 Golden Eagle

Habitat acreage for golden eagles would remain below HRV (Table 3-39) in all alternatives. Effects of the alternatives on this species habitat are the same as those described for the habitat of the brown creeper (Section 3.7.2.3.1). The only difference is that for the golden eagle, Alternatives C and D provide the most habitat in the long term.

Under Alternatives C and D, seventeen miles of new fence could have a slight negative effect on golden eagles. These large birds can easily become entangled in fences, usually leading to death. There are no nest sites in the immediate area of the proposed fencing so effects would be minimal.

3.7.4.3.1.4.1 Ranking

Alternative D would be the best for the golden eagle, followed by Alternatives C, A then B. This is because this alternative produces the most habitat in the long term with the least habitat loss in the short term. Grazing does not affect this bird.

3.7.4.3.1.5 Western Screech Owl

Habitat acreage for the western screech owl would stay below HRV under all alternatives. Alternatives A and B show short and long term acreage increases from 16,909 acres (existing) to 27,968 acres (plus ten years) to 39,027 acres (plus 30 years) (Table 3-39). Habitat acreage increases are associated with the increasing tree size over time.

Due to juniper thinning included under Alternatives C and D (Table 3-39), over the short term habitat would increase from existing, but at a slightly lower rate than under Alternatives A and B (Table 3-39). Some habitat acreage would be set back to an earlier seral/structural stage, but acreage would increase again in the long term as treated stands regrow. Noticeable improvements in habitat from thinning juniper in large tree stands would likely take longer than 30 years. Proposed treatments would benefit this species in the long term.

Under Alternatives C and D, seventeen miles of new fence would have a negative effect on this raptor species. These large birds can easily become entangled in fences, usually leading to death.

3.7.4.3.1.5.1 Ranking

Alternatives A and B would be the best for the western screech owl, followed by Alternatives D then C. This is because unmanaged juniper would get larger and increase its range. Grazing does not affect this bird.

3.7.4.3.2 Cumulative Effects

Please see the end of the wildlife section for cumulative habitat effects (Section 3.7.8) of the various past present and reasonably foreseeable future actions for all wildlife species occurring on the Grassland.

3.7.4.4 Forest Plan Consistency

Table 3-40 compares LRMP consistency with standards and guidelines by alternatives.

Table 3-40 Standards, Guidelines, and Consistencies by Alternative for Raptors.

Raptors Standards and Guidelines	Alternative A Consistency	Alternative B Consistency	Alternative C Consistency	Alternative D Consistency
Protect active raptor nests from human disturbances until nesting, feeding, and fledging are completed. Provide protection of nest sites and nesting habitat sufficient for the species involved.	Yes	Yes	Yes	Yes
Protect bald and golden eagle nesting and roosting sites as prescribed in the "Act for Protection of Bald and Golden Eagles"	Yes	Yes	Yes	Yes
Protect hawk, falcon and owl nesting and roosting sites.	Yes	Yes	Yes	Yes

3.7.5 Pronghorn (Antelope)

3.7.5.1 Current Management Direction (LRMP, FSM, etc.)

3.7.5.1.1 LRMP Antelope Winter Range Goals (LRMP 1989, pg. 4-23)

- Manage for optimum winter range conditions for pronghorn in conjunction with the Oregon Department of Fish and Wildlife. Figure 6 displays the location of Antelope Winter Range.

3.7.5.1.2 Forest Plan Management Direction for Antelope Winter Range

- Use prescribed fire periodically to improve big game winter habitat and reduce fuel conditions on a periodic basis (LRMP 1989, pg. 4-73).
- Reserve fall green-up for pronghorn. Plan forage management to meet this objective in individual Allotment Management Plans (LRMP 1989, pg. 4-75).
- Allow mechanical and non-mechanical treatments that are compatible with the primary objectives of the management area. Manage to keep shrub species (primarily big sagebrush) at or below 24 inches in height, and not over 30 inches in height (LRMP, pg. 4-77).
- Manage to provide optimal habitat for pronghorn use on winter range (LRMP 1989, pg. 4-123).
- Work towards a minimum of 50 percent vegetative ground cover comprised of 40-60 percent grasses, 10-30 percent forbs, and 5-20 percent shrubs (LRMP 1989, pg. 4-123).
- Maintain shrub species (primarily big sagebrush) at or below 24 inches in height by prescribed fire or mechanical means (LRMP 1989, pg. 4-123).

3.7.5.2 Affected Environment

Pronghorn (commonly known as antelope) are present across the Grassland throughout the year. The intensity of use varies seasonally, with the winter season seeing the highest pronghorn populations.

Rutting and fawning occur across the Grassland, particularly near wet areas, seeps, and springs. Currently there are approximately 33,878 acres of reproductive habitat for pronghorn on the Grassland. The pronghorn reproductive habitat HRV acreage ranges from approximately 54,529 acres to approximately 87,246. The Grassland is below HRV for reproductive habitat acreage, primarily because of the historic homestead areas, which were attempted to be farmed and have not recovered native or desirable non-native plant communities to date (Table 3-41).

Table 3-41 Existing Habitat and HRV for Big Game, Crooked River National Grassland.

Species	Existing Pronghorn Habitat	Range of Pronghorn Habitat acres at HRV		Comparison to HRV
	Acres	Low Acres	High Acres	Acres over (+), under (-) or within (0)
Pronghorn	33878	54529	87246	-20651

There are two types of big game winter range on the Grassland - biological and designated management areas. Biological winter range represents where animals actually range through the winter and early spring months. It is not constrained by administrative or ownership boundaries. Biological winter range boundaries were established by the Oregon Department of Fish and Wildlife by using telemetry data and field observations of habitat use. Approximately 29 percent of the Grassland administered lands are considered biological big game winter range for pronghorn (Table 3-42).

Designated management area winter ranges are subsets within the biological winter range. They are Grassland administered lands designated in the Land and Resource Management Plan specifically for emphasis on the management of pronghorn winter range habitat. Approximately 20 percent of the Grassland administered lands are designated as pronghorn winter range (MA-G1) (Table 3-42).

Table 3-42 Pronghorn Winter Ranges, Crooked River National Grassland.

Type of Winter Range	Acres	Percent of Grassland
Management Area (MA-G1)	22,700	19.5
Biological (within the analysis area)	33,264	28.7

The two most important components of winter range habitat for pronghorn are available forage and plant species composition.

Approximately 91 percent (22,738 acres) of the Grassland biological winter range falls into the forage category. This is in contrast with approximately 89 percent (22,393 acres) of forage acreage within the MA-G1 LRMP management allocation. Although these areas are identified as forage, most of them are in degraded states for wildlife because of the reasons mentioned in the introduction of this section. Sagebrush and bitterbrush are an important component of pronghorn winter forage, while grasses and forbs are essential during the spring. Presently, most of the antelope winter range was seeded in the past to non-native species. Rabbitbrush and crested wheatgrass are more common than sagebrush, bitterbrush, native bunchgrasses, and forbs.

The LRMP standard and guideline requires that shrub height within designated winter range be at or below 24 inches but definitely not over 30 inches in height (LRMP 4-123). Areas of taller shrubs will experience less or no utilization by pronghorn because they avoid areas where they are more vulnerable to predation.

Hot fires have affected vegetative composition within pronghorn winter range in the past. Non-desirable species such as cheatgrass and rabbitbrush have replaced desired species such as sagebrush and native bunchgrasses. Prescribed fire has been used in the wrong areas at the wrong time of the year resulting in decreased winter browse.

Past farming and reseeding of non-natives as well as juniper density and distribution increases have also replaced native forbs, shrubs, and grasses used by pronghorn.

3.7.5.3 Environmental Effects

3.7.5.3.1 Direct and Indirect Effects

Table 3-43 (below) displays proposed treatment acres by treatment prescription within biological pronghorn winter range on the Grassland.

Table 3-43 Proposed Treatment Acres within Biological Pronghorn Winter Range by Treatment Prescription and Alternative.

Proposed Treatments	Alt A	Alt B	Alt C	Alt D
Acres treated with Chain Saw	0	0	9,007	3,288
Acres treated with Chain Saw and Prescribed Fire	0	0	405	405
Acres treated with Chain Saw, Till, Seed, Fertilize	0	0	2,825	2,825
Acres treated with Prescribed Fire	0	0	637	637
Total Acres of Antelope Winter Range Treated	0	0	12,874	7,155

Table 3-44 (below) displays estimated pronghorn reproductive habitat by alternative projected ten (short term) and 30 years into the future (long term).

Table 3-44 Historic Range of Variability, Existing Habitat Estimates, and Short and Long-Term Habitat Acreage Projections for Pronghorn Antelope by Alternative.

Big Game Species	HRV		Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV							
	Low	High		Alt. A		Alt. B		Alt. C		Alt. D	
				10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Pronghorn	54529	87246	33878	22819	11760	22819	11760	31009	28830	27983	23255

3.7.5.3.1.1 Alternative A

Alternative A proposes no vegetation or grazing management. In the short term, without juniper treatments, the grass and shrub stands would still be present, but existing juniper trees would continue to get larger and the density, distribution, and range of western juniper would increase. In 30 years, most grass stands would be converted to shrublands and existing shrub stands would start converting to juniper woodlands.

Under Alternative A, previously farmed and seeded lands would not become suitable habitat in the short or long term. It would take longer than 30 years for those sites to convert back to native

bunchgrass and shrub species without seeding treatments. However, in that time period, habitat would continue to decline and sites would be converted to juniper woodlands. Long term without disturbance (i.e. burning or grazing), habitat for pronghorn would decrease to 11,760 acres from 33,878 acres. This is 20,651 acres below HRV habitat acreage (Table 3-44 above).

In Alternative A, 111,571 acres (the entire Grassland) would be closed to grazing. Table 3-32 displays cattle grazing by alternative. In the short term, the lack of grazing would not increase habitat quantity, but would be expected to increase habitat quality. Grass plants and forbs would be allowed to grow, spread, and increase in density at an unimpeded rate and native species would probably return to some areas sooner. Long term, open, bare areas would start filling in with grasses leading to a more continuous fuel layer and possibly larger wildfires. The quality and palatability of grasses would decrease without some form of rejuvenation/stimulation (i.e. burning or grazing). For these reasons, Alternative A would not improve the quality of habitat for pronghorn over the long term.

A connected action to "no grazing" would be a lack of additional water for wildlife from cattle water troughs. One hundred seventy five troughs would remain in place, but would only be filled by rainfall. Pronghorn use many of the water troughs on the Grassland. Decreased water availability would be detrimental to these animals.

3.7.5.3.1.2 Alternative B

Alternative B proposes no vegetation management (no juniper thinning or reseeding efforts). The effects of no vegetation management (other than livestock grazing) would be the same as those described under Alternative A.

Alternative B authorizes grazing on 102,938 acres of the Grassland. Of those acres 95,384 acres would be grazed under a deferred rotation system and 7,554 acres under a short-duration system. Under a deferred rotation grazing system, each pasture within a grazing allotment is grazed one time per season. Each year, the livestock start in a different pasture and the sequence of use is changed or "advanced" by one pasture. Under short-duration, the pastures are grazed for shorter time periods with the probability of pasture re-entry and re-grazing later in the year.

Under a deferred rotation system neither habitat quantity nor quality is expected to increase in the short term. Native grass and forb plants would not be expected to increase as rapidly as under Alternative A. There would be 8,633 acres of Grassland administered lands left ungrazed per year, outside of allotments, where re-colonization of native plant species could occur. Long term, it is expected that native plant species could recolonize historic seedings, but the time frame would be considerably longer than 30 years (assuming natural disturbances to limit juniper expansion) (Simpson 2004). In general, these grazed areas do not have continuous grasses as compared to ungrazed areas. Therefore the spread of large wildfires could be limited. Forage palatability would not be expected to decrease due to the use by cattle.

On the 7,554 acres under a short-duration system, available forage would be expected to be reduced short term with repeated grazing in the same year. Long-term native plant species would not be expected to recolonize past seedings. Higher intensity grazing would tend to sustain crested wheatgrass stands (Simpson 2004).

Due to the deferred rotation and short duration grazing systems proposed, the quality of pronghorn habitat would not be expected to improve. In this alternative, 175 water troughs would continue to be available for wildlife use throughout the Grassland. This would be beneficial for these mammals.

3.7.5.3.1.3 Alternative C

Alternative C proposes approximately 49,000 acres of juniper treatments across the Grassland. Table 3-33 displays acres by treatment and by alternative. There are three objectives of the proposed juniper treatments:

- Move toward HRV for wildlife species density, distribution, and composition.
- Maintain the grass or shrub stands.
- Promote larger juniper tree growth with decreased density (in some areas).

On the Grassland, pronghorn utilize grasslands, shrublands, and areas with very small trees. In general, short term, this alternative decreases the amount of juniper sized 1.0 diameter at breast height (dbh) up to 8.9 dbh and increases grass and shrub stands. Most of the treatments are designed to set back succession and decrease western juniper's density and range on the Grassland.

Long term, grass stands will convert to shrub stands and existing juniper trees will get larger continue to increase their range. There is a decrease in pronghorn habitat both short and long term. This decrease is projected because the rate of in-growth of small juniper and the growth of small juniper into large juniper (which decreases antelope habitat values) will exceed the rate at which juniper treatments are applied to the landscape (Table 3-33).

Alternative C also proposes to till, seed, and fertilize approximately 8,000 acres. These treatments would convert historic homesteaded acres from unsuitable to suitable antelope habitat over the short term. The quality and quantity of habitat would increase for pronghorn. Long term, without further treatments these acres will convert to shrubs, which is still a desirable antelope habitat.

Alternative C also authorizes grazing on 82,923 acres (Table 3-32 for Acreage Grazed by alternative). Of that area 7,614 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system and 70,474 under a rest rotation system. The effects would be the same as those described under Alternative B for the acreage grazed under the deferred and short duration grazing systems. There are three major differences in Alternative C as compared to Alternative B that affect wildlife habitat. Alternative C:

- Closes four allotments (8,233 acres).
- Changes two allotments to forage reserves (11,782 acres).
- Changes 85 percent of the grazed acres to a rest rotation system.

Rest rotation grazing is similar to deferred rotation except that one pasture is left ungrazed each year. Native grass and forb cover would be expected to increase due to the increased number of ungrazed acres. Under this alternative, there would be 36,981 acres left ungrazed (closed to grazing) each year. In general there would be more diversity of grass and shrub heights under Alternative C. Also, current year's forage production would be totally available to antelope on those rested acres each year. It is expected that native plant species could recolonize past homesteaded areas over the long term. Although the time frame for site conversion would be considerably longer than 30 years (assuming natural disturbances to limit juniper expansion), it would be expected to be approximately 20 percent faster than under a deferred rotation system (Simpson, 2004). The increased risk of large wildfires would be less than Alternatives A and B.

With rest pastures scattered throughout the Grassland, a mosaic of habitats is expected for the pronghorn. In this alternative, 175 water troughs would continue to be available for wildlife use throughout the Grassland. This would be beneficial for this species. There are currently no permanent water troughs in the allotments proposed for closure.

Under this alternative, the fifteen miles of new fence proposed for the Lower Desert Allotment would have no additional effects to pronghorn as they will be placed on the west side of the CRNG, outside of their habitat. The two miles of additional fence at Mud Springs could have a slight effect on pronghorn migrational movements. Pronghorn travel routes could be affected, as this big

game species does not generally jump fences. They could however become entangled in this proposed fence, risking injury or death. These fences will be built to specifications for fence construction on antelope range. The bottom wire will be at least 16 inches off the ground, which will allow antelope to pass under the fence. Mortality from the fence is expected to be less than one animal per year.

3.7.5.3.1.4 Alternative D

Alternative D proposes approximately 21,000 acres of juniper treatments across the Grassland. Table 3-33 displays acres by treatment by alternative. The objectives of the proposed juniper treatments are the same as in Alternative C. The effects to wildlife habitat are also similar to those described under Alternative C. In this alternative, fewer acres would be converted to the early seral/structural grass and shrub stages. In the long term, this alternative does not create as much pronghorn habitat as Alternative C, but more than Alternatives A and B. Habitat acreage for pronghorn antelope would decrease to 27,983 acres in the short term, slightly less than C, but 5,164 acres more than Alternatives A and B (Table 3-44).

In Alternative D, the seeding proposals and effects to this species are identical to those described under Alternative C.

Alternative D also authorizes grazing on 88,085 acres (Table 3-32 for grazing by alternative). Of those acres 6,093 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system and 77,157 under a rest rotation grazing system. For the acres grazed under the deferred and short duration grazing systems, the effects would be the same as under Alternative B. There are two major differences between Alternative C and Alternative D that affect wildlife habitat. Alternative D:

- Closes five allotments and making one smaller (13,261 acres).
- Changes 88 percent of the grazed acres to a rest rotation system.

Grazing effects of Alternative D are very similar to Alternative C. Native grass and forb cover would be expected to increase due to the increased number of ungrazed acres. Under this alternative, there would be 31,819 acres left ungrazed each year. Long term through this alternative native plant species would be expected to increase at the same rate as in Alternative C. The increased risk of large wildfires would be less than Alternative A, but higher than Alternatives B and C.

In this alternative, 175 water troughs would continue to be available for wildlife use throughout the Grassland. This would be beneficial to pronghorn. Currently, there are no permanent water troughs in the allotments proposed for closure.

Under this alternative, the fifteen miles of new fence proposed for the Lower Desert Allotment would have no additional effects to pronghorn as they will be placed on the west side of the CRNG, outside of their habitat. The two miles of additional fence at Mud Springs could have a slight effect on pronghorn migrational movements. Pronghorn travel routes could be affected, as this big game species does not generally jump fences. They could however become entangled in this proposed fence, risking injury or death. These fences will be built to specifications for fence construction on antelope range. The bottom wire will be at least 16 inches off the ground, which will allow antelope to pass under the fence. Mortality from the fence is expected to be less than one animal per year.

3.7.5.3.1.5 Ranking

Alternative C would be the best for the pronghorn, followed by Alternatives D, A, then B. This is because of the long-term increase in habitat quantity from juniper and seeding treatments and long term increases in both quality and quantity of habitat associated with decreased grazing.

3.7.5.3.2 Cumulative Effects

Please see the end of the wildlife section for cumulative habitat effects (Section 3.7.8) of the various past present and reasonably foreseeable future actions for all wildlife species occurring on the Grassland.

3.7.5.4 Forest Plan Consistency

Table 3-45 compares LRMP consistency with standards and guidelines by alternatives.

Table 3-45 Management Area Standards, Guidelines, and Consistencies by Alternative in Pronghorn Winter Range

MA-G1 Antelope Winter Range Standards and Guidelines	Alternative A Consistency	Alternative B Consistency	Alternative C Consistency	Alternative D Consistency
Use prescribed fire to improve big game winter habitat	Yes	Yes	Yes	Yes
Provide fall green-up for antelope.	Yes	Yes	Yes	Yes
Allow mechanical and non-mechanical treatments that are compatible with the primary objectives of the MA.	Yes	Yes	Yes	Yes
Manage to provide optimum habitat for pronghorn use on the winter range.	Yes	Yes	Yes	Yes
Work towards a minimum of 50% vegetative ground cover comprised of 40-60% grasses, 10-30% forbs, and 5-20% shrubs.	Yes	Yes	Yes	Yes
Maintain shrub species at or below 24 inches in height by prescribed fire or mechanical means.	Yes	Yes	Yes	Yes

* Inaction (e.g. not controlling juniper expansion) does not constitute a violation of Forest Plan standards and guidelines. LRMP inconsistencies are constituted by Federal actions.

3.7.6 Mule Deer

3.7.6.1 Current Management Direction (LRMP, FSM, etc.)

3.7.6.1.1 LRMP Metolius Deer Winter Range Goals: (LRMP 1989, pg. 4-23-4)

- Produce high quality deer winter range habitat to support ODFW management objectives for the wintering deer population. Map 6 - Special Management Area displays the location of the Metolius Deer Winter Range.

3.7.6.1.2 LRMP Standards and Guidelines for mule deer winter range:

- Use prescribed fire periodically to improve big game winter habitat and reduce fuel conditions on a periodic basis (LRMP 1989, pg. 4-73).
- Maintain early season livestock use (Prior to August 1 – per CRNG Integrated Management Review, 1999).
- Manage to provide optimum habitat for deer use on the winter range (LRMP 1989 pg. 4-124).
- Manage 40 percent of the total area in cover. Maximum distance from cover to forage should not exceed 400 feet (LRMP 1989 pg. 4-124).
- Give top priority to providing high quality forage (fall green-up) for deer (LRMP 1989 pg. 4-124).

- In areas of extensive juniper encroachment, remove juniper in irregular shaped blocks to work toward an optimum 40/60 cover/forage ratio (LRMP 1989 pg. 4-125).

3.7.6.2 Affected Environment

Mule deer are present across the Grassland throughout the year. The intensity of use varies seasonally, but is most intense during the winter season, especially on the west side of the Grassland in the area known at the Metolius Mule Deer Winter Range.

Rutting and fawning occur across the Grassland, particularly near the wet areas, seeps, and springs. There are approximately 30,211 acres of reproductive habitat for mule deer. The HRV mule deer reproductive habitat acreage is approximately 38,256 acres to approximately 64,775 acres. The Grassland is below the HRV for mule deer reproductive habitat acreage (Table 3-46).

Table 3-46 Existing Habitat and HRV for Mule Deer, Crooked River National Grassland.

Big Game Species	Existing	HRV		Comparison to HRV
	Acres	Low Acres	High Acres	Acres over (+), under (-) or within (0)
Mule Deer	30211	38256	64775	-8045

As stated within the pronghorn discussion, there are two types of big game winter range on the Grassland - biological and designated management areas. Approximately 47 percent of the Grassland managed lands are considered biological winter range for mule deer.

Again, designated management area winter ranges are subsets within the biological winter range. Approximately 11 percent of the Grassland managed lands are designated as mule deer winter range (MA-G2) (Table 3-47). Cover and forage are the two main habitat components of mule deer winter range for which the LRMP contains guidelines.

There are 32,146 forage acres and 17,439 cover acres in the biological winter range, a 65:35 forage/cover ratio. In the MA-G2 LRMP management allocation, there are 5,010 forage acres and 6,742 cover acres, a 43:57 forage/cover ratio. Neither meets the 60:40 forage/cover ratio objective described in the LRMP (page 4-24) or the standard and guideline (LRMP page 4-120) (Table 3-47).

Table 3-47 Mule Deer Winter Range Information, Crooked River National Grassland

Type of Winter Range	Acres	Percent of Grassland	Forage Acres	Cover Acres	Forage/Cover
Management Area	12,740	11.0	5,010	6,742	43:57
Biological (within the analysis area)	54,157	46.7	32,146	17,439	65:35

Succession from shrub-steppe to juniper woodland communities, due to reduced fire return intervals over the last 100+ years (associated with fire suppression and historic, grazing and farming), is the primary reason for poor cover/forage ratios within the MA-G2 mule deer winter range allocation.

3.7.6.3 Environmental Effects

3.7.6.3.1 Direct and Indirect Effects

Table 3-48 (below) displays the acres of treatment by prescription and alternative within biological mule deer winter range.

Table 3-48 Proposed Treatment Acreage within Biological Mule Deer Winter Range by Treatment Prescription and Alternative.

Proposed Treatments	Alt A	Alt B	Alt C	Alt D
Acres grazed after August 31	0	0	0	0
Acres treated with Chain Saw	0	0	1,981	702
Acres treated with Chain Saw, Pile and Prescribed Fire	0	0	1,189	1,189
Acres treated with Chain Saw and Prescribed Fire	0	0	193	193
Acres treated with Prescribed Fire	0	0	1196	0
Total Acres treated	0	0	4,559	2,084

Table 3-49 (below) displays estimated mule deer reproductive habitat, by alternative, projected ten (short term) and 30 years into the future (long term).

Table 3-49 Historic Range of Variability, Existing Habitat Estimates and Short and Long-Term Habitat Acreage Projections for Mule Deer by Alternative.

Big Game Species	HRV		Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV							
	Low	High		Alt. A		Alt. B		Alt. C		Alt. D	
				10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Mule Deer	38256	64775	30211	19152	12105	19152	12105	17809	26866	17245	21282

Although pronghorn and mule deer use slightly different habitats, the effects from the alternatives are the same.

Under Alternatives C and D, fifteen miles of new fence would have a negative effect on mule deer winter range habitat. Winter range habitats are important for the survival of this species and additional fences can lower winter survival rates if deer become entangled in fences, risking injury and most likely death. Entanglement is most probable on winter ranges because big game animals can be in a weakened state during harsh winters. It is estimated that this fence could cause the mortality of up to 30 deer per year (Zalunardo, pers. comm.) in winters with extreme cold and snowfall.

3.7.6.3.1.1 Ranking

Alternative C would be the best for mule deer, followed by Alternatives D, A, then B. This is because of the long-term increase in habitat quantity from juniper and seeding treatments and long term increases in both quality and quantity of habitat associated with decreased grazing.

3.7.6.3.2 Cumulative Effects

Please see the end of the wildlife section for cumulative habitat effects (Section 3.7.8) of the various past present and reasonably foreseeable future actions for all wildlife species occurring on the Grassland.

3.7.6.4 Forest Plan Consistency

Table 3-50 compares LRMP consistency with standards and guidelines by alternatives.

Table 3-50 Management Area Standards, Guidelines, and Consistencies by Alternative in Mule Deer Winter Range

MA-G2 Metolius Deer Winter Range Standards and Guidelines	Alternative A Consistency	Alternative B Consistency	Alternative C Consistency	Alternative D Consistency
Use prescribed fire to improve big game winter habitat	Yes	Yes	Yes	Yes
Maintain early season livestock use	Yes	Yes	Yes	Yes
Manage to provide optimum habitat for deer use on the winter range.	Yes	Yes	Yes	Yes
Maximum distance from cover to forage should not exceed 400 feet.	Yes	Yes	Yes	Yes
Provide fall green-up for deer.	Yes	Yes	Yes	Yes
In areas of extensive juniper encroachment, remove juniper in irregular shaped blocks to work towards 40/60 cover/forage ratio.	Yes	Yes	Yes	Yes

* Inaction (e.g. not controlling juniper expansion) does not constitute a violation of Forest Plan standards and guidelines. LRMP inconsistencies are constituted by Federal actions.

3.7.7 Management Indicator Species

3.7.7.1 Current Management Direction (LRMP, FSM, etc.)

3.7.7.1.1 Forest Plan Management Direction for the Northern Flicker and Juniper Old Growth:

- Use prescribed fire only to reduce fuel load if natural fuels accumulate to a level likely to result in a catastrophic fire (LRMP 1989, pg. 72).

3.7.7.2 Affected Environment

The management indicator species for the Ochoco National Forest and Crooked River National Grassland are primary cavity excavators including: pileated woodpecker, white-headed woodpecker, and the northern flicker.

Table 3-51 Existing Habitat and HRV for the Northern Flicker, Crooked River National Grassland.

MIS Species	Existing	HRV		Comparison to HRV
	Acres	Low Acres	High Acres	Acres over (+), under (-) or within (0)
Pileated Woodpecker	0	0	0	0
White-headed Woodpecker	710	690	1725	0
Northern Flicker	2786	22674	47839	-19888

The pileated woodpecker inhabits the moist and dry grand fir, Douglas fir, and moist ponderosa pine PAGs. None of these PAGs exist on the Grassland. The pileated woodpecker will not be discussed further.

Habitat acreage for the white-headed woodpecker (710 acres), which relies on the ponderosa pine PAG, is within HRV (Table 3-51). These birds prefer open pine stands comprised of large trees.

The northern flicker (previously known as the common flicker) is the only management indicator species for the Grassland associated with old growth juniper. Refer to the section on western juniper (FEIS, Chapter 3, Section 3.2.2.1) for a more detailed description of old growth juniper.

The WILDHAB analysis identified approximately 3,810 acres of flicker habitat. The HRV acreage for this bird's habitat ranges from approximately 23,609 acres to 50,026 acres. The Grassland is below HRV acreage by approximately 19,800 acres (Table 3-51).

The flicker, a generalist for feeding habitat, is the only primary cavity excavator of large juniper on the Grassland. Many secondary cavity nesters such as the mountain and western bluebirds, ash-throated flycatchers, and swallows depend on flickers to provide nesting cavities.

3.7.7.3 Environmental Effects

3.7.7.3.1 Direct and Indirect Effects

Table 3-52 displays HRV, existing habitat acres and projected habitat acres for Grassland MIS species.

Table 3-52 Historic Range of Variability, Existing Habitat, and Projected Habitat Acres by Alternative for MIS Species, Crooked River National Grassland.

MIS Species	HRV		Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV							
				Alt. A		Alt. B		Alt. C		Alt. D	
	Low	High		10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
White-headed Woodpecker	690	1725	710	710	710	710	710	710	710	710	710
Northern Flicker	22674	47839	2786	2786	2786	2786	2786	2835	7951	2835	5127

The dry ponderosa pine PAG dependent white-headed woodpecker would not be affected by seeding treatments or by grazing. These birds are dependent on large trees. Habitat acreage for this species is within HRV and would remain so for both the short (ten years) and long term (30 years) under all four alternatives (Table 3-52).

The effects of all alternatives on this species are identical to those described for the Lewis' woodpecker (Chapter 3, Section 3.7.3.3.1.3). Both the Lewis' and white-headed woodpeckers rely on pine trees. No pine trees would be harvested under any alternative. The effects to habitat are identical in all alternatives.

Habitat acreage for the northern flicker would remain below HRV (Table 3-52) in all alternatives.

Neither the seeding nor grazing proposals would affect these birds. This bird requires large trees in ponderosa pine and/or juniper tree stands with open canopies.
Habitat acreage under both Alternatives A and B would be expected to remain static over the short through long term because successional changes associated with management induced or natural disturbances would not generate open stand conditions. In the short term, these trees would not grow out of the size class 4 (9-20.9 inches dbh) and into size class 5 (21 inches dbh and larger), since growth is extremely slow in juniper tress. In the absence of management, there would not be any thinning done to the stands of junipers to help accelerate that growth.

Alternatives C and D would actively treat stands to create open canopy conditions, which this species prefers. Not only will succession create larger trees over time, treatments would increase growth rates and create open stand habitat. Short and long term, these alternatives create more habitat than Alternatives A and B.

Under Alternatives C and D, seventeen miles of new fence would have a slight negative effect on these MIS species. While it is not as common as for the larger birds such as raptors, these smaller birds can become entangled in fences, risking injury or death.

3.7.7.3.1.1 Ranking

There is no preferred alternative for the white-headed woodpecker. Effects to habitat are identical in all alternatives.

Alternative C creates the best habitat for the northern flicker, followed by Alternatives D, and A and B. Alternative C results in the most habitat created for the flicker in the long term. Grazing does not affect these birds.

3.7.7.4 Forest Plan Consistency

Table 3-53 compares LRMP consistency with standards and guidelines by alternatives.

Table 3-53 Management Area Standards, Guidelines, and Consistencies by Alternative in Juniper Old Growth.

MA-G5 Old Growth Juniper Standards and Guidelines	Alternative A Consistency	Alternative B Consistency	Alternative C Consistency	Alternative D Consistency
Use prescribed fire only to reduce fuel load if natural fuels accumulate to a level likely to result in a catastrophic fire.	Yes	Yes	Yes	Yes

3.7.8 Cumulative Effects for all Wildlife (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Past effects to the vegetation and wildlife habitat provided by the juniper PAG, which is the most common vegetation on the Grassland have been substantial. These effects are enumerated, based upon the findings in the Interior Columbia Basin Ecosystem Management Project (ICBEMP 1997).

Adverse effects to juniper plant communities have been caused by changes in native disturbance regimes and successional processes. The changes have been caused by

- Noxious weeds, which are spreading rapidly.
- Juniper expansion, which has reduced herbaceous understories and biodiversity.
- Cheatgrass establishment, which has increased soil erosion and fire frequency and reduced biodiversity.
- The expansion of agricultural and urban areas on non-federal lands, which has reduced the amount of habitat available for use by many wildlife species.

This expansion of agriculture and urbanization has also changed the function some of the remaining juniper vegetation and the habitat it provides due to fragmentation, exotic species, disruption of natural fire cycles, overuse by livestock and loss of native species diversity.

Increased fragmentation and loss of connectivity within and between blocks of wildlife habitats in the juniper PAG have isolated some habitats and populations of animals and reduced the ability of populations to move across the landscape, which will result in long-term loss of genetic interchange. These juniper plant communities generally receive less than 12 inches of precipitation per year and recover naturally at an extremely slow rate. They are also highly susceptible to degradation and easily dominated by cheatgrass or some noxious weed species.

Additionally, open road densities and human activities on these low elevation areas have increased steadily over time. High road densities cause many wildlife species to leave the area to avoid human activity. Recreation and other uses of the juniper PAG vegetation have increased because of increasing human populations around the Grassland and throughout the Columbia River Basin. These uses can increase wildlife displacement and vulnerability to mortality, fragment habitats, and allow for access of exotic plants into new locations.

Cumulative effects to the various wildlife species on the Grassland are further influenced by three basic actions included in this FEIS. These actions (juniper management, re-seeding of old homesteaded land, and domestic livestock grazing) are described in the direct/indirect effects sections of this document and will be further analyzed in this section in light of other past, and reasonably foreseeable future actions.

Western juniper has increased its distribution and density on the Grassland and adjacent lands. This expansion has been attributed to livestock grazing which reduces the fine fuels required for effective fire spread, climatic changes (mild temperatures and above average precipitation in the late 1880s and early 1900s), and reduction in the fire frequency due to fire exclusion and cessation of Native American burning (see Section 3.2.2 for more information on western juniper). This change has happened most notably over the past 100 to 150 years. The conversion from grass and shrub dominated habitats to more dense and well-distributed juniper woodland stands has been occurring across the Grassland at approximately the same rate. The effect of juniper increasing its distribution and density has been a reduction in the amount of grass and shrub dominated wildlife habitats and a subsequent reduction in wildlife diversity (type and number of species present) in these sites. The amount of seedling/sapling sized and pole sized juniper has increased by 23 and 10 percent respectively on the Grassland from the average historical range Currently, juniper is becoming dominant on three to four additional percent of the Grassland each year through natural in-growth of these trees (see Section 3.2.2 for more information on western juniper). This will continue to occur unless either natural or prescribed fire or mechanical thinning is used to remove juniper. On-going projects designed to manage the distribution to juniper are currently in progress. The Grizzly Landscape Project is returning approximately two to three percent of seedling/sapling and pole size juniper dominated vegetation back to a shrub and/or grass dominated S/S stage per year. The project began in 2003 and will conclude in 2004. Additionally, the BLM proposes to treat 3,570 to 6,270 acres of juniper-dominated vegetation to revert these acres back to an earlier successional stage. The Natural Resource Conservation Service also offers cost share incentives to adjacent landowners for juniper treatments. The amount of acreage treated annually is unknown. At the same time, it is assumed that the suppression of wildfire will also continue on the Grassland, allowing additional areas where juniper trees will continue to be established.

In the future, juniper density and distribution management will probably continue on the Grassland, BLM, and adjacent private lands. As of this time, there are no firm proposals for location or extent of juniper treatment, but it would be reasonable to assume that the rate of treatment would at least be equal to present day rates. As indicated in the direct/indirect effects section of this document, the current rate of juniper treatment, with the additional land management activities of suppressing wildfires, will probably result in the continued, slow increase of juniper dominated vegetation, which will further reduce habitat for those habitat specialist associated with the grass and shrub dominated successional stage of the juniper PAG.

The increase in the density and distribution of juniper has adversely affected most of the animals discussed in the wildlife section above. In the juniper PAG, most all of the habitat specialists are associated with the early (grass and shrub dominated) stage of the juniper PAG. This is because historically and over time, this was the most abundant habitat condition present on the landscape. Because of the abundance of this habitat type, animals using the area needed to become specialized in using certain portions of the habitat, thus separating their niches or partitioning the resources

available to avoid competition between species. Past activities reduced the amount of early seral habitats. Although active juniper management is occurring and proposed, it is at a rate that is slower than the in-growth of juniper, therefore habitat for the early seral juniper associated wildlife will continue to decrease over the short and long term. Locally (Grassland-wide) this would give concern for population viability of some of these species. Therefore, a lack of sufficient amounts of juniper treatments would result in a reduction in a short or long term chance of re-establishing species which have lost their local viability (such as the sage grouse and sharp-tailed grouse) on the Grassland.

Neither Alternative A nor B in this project would return the quantity of total grass and shrub dominated vegetation to historic levels; Alternatives C and D would. However, quantity of suitable grass and shrub wildlife habitats would not reach historic levels under any alternative (refer to Section 3.7.1.3 for a discussion of suitable vs. non-suitable wildlife habitat). VEMG made the assumption that the best prognosis of long-term viability for various suites of wildlife species was to manage the quantity and distribution of their habitats within the historic amounts that occurred naturally. Of the alternatives considered, Alternative C comes the closest to re-establishing the amount of suitable grass and shrub dominated vegetation due to the large amount of juniper management and seeding proposed. Alternative D is the next best and Alternatives A and B will not manage juniper or seed at all, therefore decreasing the amount of suitable grass and shrub dominated vegetation over time.

During the same time that young stands of juniper have increased in distribution and density across the Grassland, stands of very old juniper have decreased. The decrease in old trees is attributable to early European man cutting these trees as fuel wood or for construction during the homestead era. One hundred years is not enough time for trees that have re-seeded to develop into “old growth” juniper. This change has affected only a few wildlife species such as the loggerhead shrike. No further effects would be expected to “old growth” juniper through any alternatives in this project. Large, old juniper trees will be increasing through time because of protection afforded these trees through long term management goals on the Grassland. The viability prognosis for species associated with old growth juniper will improve with time.

Cumulative effects to the ponderosa pine PAG are far less significant. Most wildlife species associated with this PAG are associated with mature tree stands. Over time throughout the Interior Columbia River Basin, large ponderosa pine has been targeted for removal for the lumber industry, resulting in a vast reduction in the amount of large, open stands of pines (ICBEMP 1997). To a lesser degree, the suppression of fires has also allowed the understories of these tree stands to become more dense, causing competition for moisture and nutrients. This competition has made these large, old ponderosa pines susceptible to attacks from insects, primarily from western pine beetle. No commercial harvest of ponderosa pine has occurred on the 1,717 acres of ponderosa pine PAG communities since the acres have been included as part of the Grassland. Prior to this time, only occasional trees were cut by homesteaders for construction or firewood. Because of fire suppression, these pine stands are becoming denser with both young pine and juniper establishing.

Because of the time span involved in succession in the ponderosa pine PAG and because of the small amount of this PAG present on the Grassland, no significant change in seral condition is expected in either the short (ten year) or long (30 year) term. Habitat for species such as Lewis’ and white-headed woodpeckers, western gray squirrel, pine grosbeak, etc. is within HRV for the ponderosa pine PAG and there are no alternatives that would move the quantity of habitat sufficiently enough to be outside of HRV. Habitat is secure for these species and could improve over the long term with additional management projects to control understory tree stocking levels.

ICBEMP also identified the presence and spread of cheatgrass and noxious weeds as a major threat to areas occupied by the juniper PAG. There are currently 3,000 acres on the Grassland dominated by noxious weeds. Sites dominated by these species do not provide suitable habitat for endemic

wildlife. Efforts to eradicate some of the existing populations and prevent the introduction of new populations would continue under all alternatives based upon the decisions made in the Forest's 1998 Integrated Weed Management Plan. The current weed management plan in place does not allow the Grassland to work on controlling new populations of noxious weeds that have become established. The current NEPA document also does not allow the use of some herbicides that have been shown to be more effective and also target only specific species of noxious weeds. Therefore, at present, control efforts would not be expected to result in a measurable change in habitat acres for any wildlife species under any alternative in the short term. The number of acres currently infested by invasive plant species is less than one percent of the current habitat acres for the Grassland. In the long term, The Pacific Northwest Region will issue a Final Environmental Impact Statement for Preventing and Managing Invasive Plants (the Draft is now out for public review). In the future, this document, coupled with the ongoing Noxious Weed Control EIS would allow the Grassland to work on controlling all 3,000 acres of habitat that have known weed infestations. Long term, this could increase the amount of suitable habitat by one percent on the Grassland.

As noted in ICBEMP (1997), the expansion of agricultural and urban areas on non-federal lands has reduced the amount of habitat available for use by many wildlife species through out the Interior Columbia River Basin. The rate of this expansion has increased in recent time.

Historically, agricultural development occurred on approximately 60,000 acres of the Grassland. These acres were homesteaded and agricultural activities were conducted until as recently as 1940. This agricultural development resulted in a total conversion from juniper PAG habitats to cereal grain and hay farming. Habitats for the wildlife species analyzed in this section were lost during this homestead era. Currently most of the homesteaded acres managed by the Grassland are still not providing habitat for most wildlife species associated with the Grassland. Today these sites are generally dominated by non-native vegetation, either through direct seeding of non-native vegetation for soil stabilization or through the passive establishment of exotic vegetation.

Efforts at rehabilitating similarly disturbed sites throughout the Columbia River Basin is sporadic and generally of small scale. The rate at which habitats are being lost through the establishment of exotic vegetation and/or noxious weeds is far greater than is the rate of reclaiming vegetation dominated by exotics into native plant communities (ICBEMP 1997).

Under Alternatives C and D, there are proposals to rehabilitate 8,344 acres of old homestead ground through direct seeding. These two proposals would return approximately 14 percent of the non-functional habitat on the Grassland back to a functional grass and/or shrub-dominated habitat useable by many of the habitat specialists analyzed in this section.

Continued urban, agricultural, and recreational development on adjacent private lands would further reduce the amount and distribution of wildlife habitat outside the boundaries of Grassland administered lands. This development adjacent to the Grassland would also increase landscape fragmentation and isolate the Grassland's habitats for many wildlife species. These developments are occurring adjacent to all portions of the Grassland, but are particularly intense around the western boundary of the Grassland adjacent to the town of Sisters and Lake Billy Chinook. Private land development, specifically residential and commercial development associated with subdivisions, towns, and cities would be expected to eliminate habitat in those areas for all habitat specialists regardless of the alternative. While private land development will not impact Grassland habitat or HRV acreage calculations (HRV acreage was only calculated for National Forest System lands within the Grassland) under any of the alternatives, remaining habitat, primarily associated with public lands, would be expected to become more important to the residual populations of these species.

On-going human activities permitted on the Grassland will continue. These activities include sightseeing, dispersed camping, hunting, hiking, horseback riding, etc, as well as permitted activities such as field dog trials and the Ridge Rider endurance horse event. Other human disturbances to wildlife are occurring through the maintenance of utilities, including pipelines, power lines, operation of Pelton-Round Butte hydroelectric project, as well as the construction of the Deschutes Valley Water municipal pipeline. All of these activities will cause fine scale adverse wildlife effects like those noted in ICBEMP (1997).

Wildfires have historically burned approximately 2,500 acres per year. Under Alternatives A and B, these numbers would be expected to be similar and possibly increase due to the increasing buildup of fuels and continued fuel continuities. This would be expected to result in some regulation of the disturbance regime on the Grassland. Although some wildfires may become very intense, causing additional infestations of noxious weeds, most should be low intensity and would serve to help maintain the amount of early seral juniper habitat, which is below HRV currently.

If potential fires were to occur in the ponderosa pine PAG, habitat acreage for ponderosa pine dependant species such as Lewis' and white-headed woodpeckers, western gray squirrel, pine grosbeak, etc. would move from within HRV to below HRV. The pine PAG on the Grassland is comprised of only 1,700 acres. One wildfire could remove the large tree habitat within this PAG completely.

Alternatives C and D would be expected to reduce the size, intensity, and severity of wildfires by reducing fuel loadings and breaking fuel continuities. The risk of habitat loss in the pine PAG would be greatly decreased. Smaller and less intense wildfires would benefit all the juniper related species' habitat.

3.8 Proposed, Threatened, Endangered and Sensitive Species (PETS)

The Endangered Species Act of 1973 (ESA) requires that all Federal agencies protect threatened and endangered species and their habitats to aid population recovery. The U.S. Fish and Wildlife Service have responsibilities for maintaining Federal threatened and endangered lists for animals and plants. The U.S Fish and Wildlife Service and the National Oceanic and Atmospheric Administration (Fisheries Division) share implementation and regulatory responsibilities for ensuring compliance with ESA. The Regional Forester has responsibility for designation of sensitive species as per Forest Service Manual, Section 2670. Forest Service policy for sensitive species is to manage these plants and animals to provide long term viable populations and prevent population and distribution declines that may lead to listing under ESA.

In June 2003, the Deschutes and Ochoco National Forests and the Bureau of Land Management (BLM) Prineville Office completed the "Joint Aquatic and Terrestrial Programmatic Biological Assessment". The intent of this basin-wide programmatic approach was to consult on programs (not individual projects) as they relate to the proposed, endangered, or threatened species occurring within the action area.

"Project design criteria are used as sideboards and a filter…If the program activities meet all applicable Criteria, then the program activity should have either no effect to listed species or if there is an effect, the effect should not likely adversely affect a listed species…the Service concurs with the Deschutes, Ochoco, and BLM effects determination that the program activities, when consistent with all applicable Project Design Criteria, are not likely to adversely affect…bald eagle, or bull trout." (Concurrence letter, USFWS 2003).

3.8.1 Current Management Direction (LRMP, FSM, etc.)

3.8.1.1 Grassland Standards and Guidelines

- Consult with the U.S. Fish and Wildlife Service when conflicts between project activities and habitat needs cannot be resolved, or when uncertainty exists.
- Perform a field reconnaissance when suitable habitats or reported locations are suspected to occur in the area of influence of the project, to more precisely verify the presence, abundance, and distribution of the sensitive species. If the search is conducted during a season of the year when positive identification is probable, and no listed species are found, document this fact and no further investigations will be needed.
- Spell out identified safeguards in the environmental analysis and project plan; project personnel will be fully responsible for being aware of and implementing these safeguards. Supervisors of the activity must assure that actions which jeopardize the listed species do not occur.
- Defer actions which may affect habitat for Federally listed endangered or threatened species, if they can not be avoided, until a formal consultation with the endangered species branch of the Fish and Wildlife Service is completed to determine a course of action.

3.8.2 PETS Plants

3.8.2.1 Affected Environment

A pre-field review was completed. It consisted of checking existing records for documented occurrences, determining probability of additional occurrences of any PETS species and a determination if any additional field surveys are needed. The pre-field review incorporated the following (Lesko 2004):

- USFWS Endangered and Threatened Wildlife and Plant Species List (U.S. Fish and Wildlife Service 1993 and 1997).

- Region 6 Sensitive Species List (USDA 1999)
- Oregon Natural Heritage Program's Rare, Threatened, and Endangered Species List (ONHP 2001).
- Deschutes Valley Water, Geneva Underburn, Squaw Cr. Fish Habitat, and other Biological Evaluations, surveys and records.
- The Island provisional plant species list (BLM) and other literature, maps and information.

There are no proposed, endangered, or threatened plant species documented or suspected of occurring in the geographic area that includes the Crooked River National Grassland. No habitat is present for these species (Lesko 2004).

Habitat is present for several species listed as sensitive by the Forest Service in Region Six. Resources used to identify potential habitat were: aerial photo interpretation, vegetation map information, as well as personal knowledge of the project area. Many of these species are endemic, i.e. their distribution is restricted to specific geographic areas. Table 3-54 (below) displays Region 6 sensitive plant species documented or suspected to be present on the Grassland.

Only one species, Estes wormwood (*Artemisia ludoviciana spp. estesii*), had been previously documented within the analysis area. Some monitoring of this species has occurred and populations and habitat for this species appear stable (Halvorson 2002).

In 2003, Peck's penstemon (*Penstemon peckii*) was documented on the Grassland. Monitoring indicates populations and habitat are stable and possibly expanding (Pajutee 2002).

The Botany Specialist Report, pages 24-32 (Lesko 2004b) provides additional species specific information, including other sensitive species in Region-6 without habitat on the Grassland.

Table 3-54 Region 6 Sensitive Species Documented or suspected on the Grassland, 2003

Species	Documented/Suspected
Achnatherum hendersonii (Vasey) Bark. **Henderson's needlegrass**	S
Achnatherum wallowaensis Maze & K.A. Robson **Wallowa needlegrass**	S
Artemisia ludoviciana Nutt. ssp. *estesii* Chambers **Estes wormwood**	D
Astragalus peckii Piper **Peck's milkvetch**	S
Camissonia pygmaea (Dougl. ex Lehm) Raven **dwarf suncup**	S
Carex hystericina Muhl. ex Willd. **porcupine sedge**	S
Mimulus evanescens Meinke **disappearing monkeyflower**	S
Penstemon peckii Pennell **Peck's penstemon**	D*
Rorippa columbiae Suksdorf **Columbia cress**	S
Thelypodium howellii S.Wats **Howell's thelypody**	S

* Documented in 2003

Approximately half of the Grassland (approximately 65,000 acres) was occupied by homesteaders and dry-land farmed. The SCS and the Forest Service rehabilitated (tilled and seeded) most of the farmed land during the 1940s to the 1960s. Due to the nature and degree that these sites were

altered as a result of past homesteading, farming, disking and seeding, today they no longer provide habitat for sensitive plant species.

The earliest surveys for sensitive plant species occurred in the early to mid 1990s. Surveys were conducted primarily at the limited focus and intuitive control survey levels (e.g. a botanist, after reviewing aerial photos and topographic maps, visits the site looking for the sought after plant in habitats and locations where it would be expected to exist). These surveys have occurred primarily on specific project areas such as proposed pipelines, trails, campgrounds, etc. Additional surveys were completed in 2003. Survey records can be found at the Lookout Mountain Ranger District Office in Prineville, Oregon.

Surveys completed in 2003 documented several occurrences of Peck's penstemon that included approximately 1,500 plants on the Grassland analysis area. This comprises approximately 0.1 percent of the known global population (Dollhausen 2003).

Earlier surveys have documented Estes wormwood along the banks of the Deschutes and Crooked Rivers within or near the Grassland.

An assessment of pre-settlement populations of sensitive plant species is very difficult. Because habitat quality and plant species diversity in both upland and riparian areas has been altered these species are likely to have been more abundant. This is true for at least one species, disappearing monkeyflower (*Mimulus evanescens*), with the only local occurrence documented on Grizzly Butte in 1894. This population appears to have been extirpated.

For sensitive plant species suspected of occurring on the Grassland monitoring data indicate most habitats on public lands currently appear stable. Exceptions occur where invasive plants (noxious weed infestations) have expanded, primarily along heavily disturbed areas such as old town sites, roadsides, and utility corridors.

Expansion of western juniper is currently not affecting viability of other native plants species.

3.8.2.2 Environmental Effects

3.8.2.2.1 Direct and Indirect Effects

There are no proposed, endangered, or threatened plant species documented or suspected of occurring within the Crooked River National Grassland analysis area. No known habitat exists for these species.

3.8.2.2.1.1 Alternative A

3.8.2.2.1.1.1 Riparian Associated Species

This alternative includes no activities that could affect individuals or habitat for these species. Habitat and populations would be maintained. Long-term (> ten years), increased risk of wildfire associated with cessation of grazing and western juniper expansion is negligible (Bell 2003). Wildfire is not expected to have a measurable effect on habitat. Information on documented occurrences also indicates primary habitat and populations of these species are largely outside the Crooked River National Grassland. Therefore, no impact to *Artemisia ludoviciana* ssp. *estesii, Camissonia pygmaea, Carex hystericina, Mimulus evanescens, Penstemon peckii, Rorippa columbiae,* and *Thelypodium howellii* is expected.

3.8.2.2.1.1.2 Upland Associated Species

This alternative includes no activities that could affect habitat or populations of these species. Habitat and populations would be maintained. Long-term increased risk of wildfire may occur due to cessation of grazing and subsequent fine fuels buildup. Wildfire may affect individuals or habitat directly or indirectly by creating conditions that increase non-native invasive plants that could displace sensitive plants. However, increased risk is considered negligible (Bell 2003). Wildfire is not expected to have a measurable effect on habitat. Information on populations also suggests that primary habitat and populations of these species are largely outside the Crooked River National Grassland. Therefore no impact to *Achnatherum hendersonii, A. wallowaensis,* and *Astragalus peckii* is expected.

3.8.2.2.1.2 Alternatives B, C, and D

3.8.2.2.1.2.1 Riparian Associated Species

All of the action alternatives avoid mechanical disturbance (e.g. tilling) of high probability habitat (riparian areas and wet meadows) for *Artemisia ludoviciana* ssp. *estesii, Camissonia pygmaea, Carex hystericina, Mimulus evanescens, Penstemon peckii, Rorippa columbiae* and *Thelypodium howellii*. Habitat would be maintained.

Alternatives C and D propose to seed on the uplands. Upland grasses are not likely to expand into riparian habitat and affect these species. Alternative B avoids seeding.

Activities such as juniper density reduction and prescribed burning treatments that would occur within riparian areas could damage some individual *Artemisia ludoviciana* ssp. *estesii, Camissonia pygmaea, Carex hystericina, Mimulus evanescens, Penstemon peckii, Rorippa columbiae* and *Thelypodium howellii* or their habitats. However these activities are relatively minor in scale because they are expected to affect a very small portion (less than five percent) of suitable habitat and therefore would be unlikely to affect viability of populations.

No measurable increase or decrease of wildfire risk is associated with these alternatives; therefore, wildfire is not expected to affect habitat

These species may occur in unprotected riparian areas. With the exception of *Thelypodium howellii*, monitoring on lands managed by the BLM (adjacent lands) indicates these species maintain viable populations in grazed areas.

Livestock grazing may affect habitat for *Thelypodium howellii* but the species appears to be extirpated from the State of Oregon. The majority (95 percent) of suitable habitat in the analysis area would not be grazed; therefore, no effects to viability are expected.

Project design criteria (FEIS, Chapter 2, Section 2.5) include the protection of riparian habitats and provisions that any new discovery of PETS species would be considered during project implementation.

Therefore anticipated effects of Alternatives B, C, and D would be that some individuals or habitat may be affected, but is not expected to result in a trend towards listing or loss of viability for these species.

3.8.2.2.1.2.2 Upland Associated Species

Proposed seeding, tilling, juniper control, and fuels treatments would have no measurable effect to *Achnatherum hendersoni* and *A. wallowaensis* because these activities are not proposed for scabland areas which are the primary habitat of these species.

Project design criteria (FEIS, Chapter 2, Section 2.5) protect scabland soils from activities such as slash piling that could affect habitat and viability of these species. These shallow, rocky soils are not suited to equipment associated with tilling/seeding and so are also "naturally protected" from these activities. These sites have inherent low productivity, and so are not experiencing measurable increases in juniper density or natural fuels. Consequently, they would not be affected by juniper reduction projects or burning.

Grazing could affect individual *Achnatherum hendersoni* and *A. wallowaensis* plants by grazing and trampling. These habitats are presently considered stable with current grazing management. These sites also produce very little forage. Existing and proposed grazing seasons occur when these sites are beginning to dry out and so very little livestock use would occur on these sites.

The western portion of the analysis area may provide some habitat for *Astragalus peckii*. Some livestock grazing would occur on the western portion of the analysis area. Moderate grazing could result in the loss of some individuals though is not expected to affect the viability of this species. Because *Astragalus peckii* is an early succession species, juniper and fuels treatments are expected to provide additional habitat for this species.

No measurable increase or decrease of wildfire risk to these species is associated with these alternatives.

Project design elements include the provision that any new discovery of PETS species would be considered during project implementation.

Anticipated effects of action alternatives would be that some individual *Achnatherum hendersoni*, *A. wallowaensis* and *Astragalus peckii* plants or habitat may be affected but is not expected to result in a trend towards listing or loss of viability for these species.

3.8.2.3 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Habitat quality for the majority of sensitive plant species, including those mentioned above has likely declined since pre-settlement conditions. Road construction, farming, livestock grazing, fire suppression, introduction of non-native plants, and other factors have resulted in loss of intact bunchgrass, sagebrush, juniper woodland, meadow, and riparian habitat. Unfarmed bunchgrass, sagebrush and juniper woodland exists on approximately half of the Grassland.

Though habitat quality has declined since pre-settlement, observations and monitoring over the last decade indicates habitats for sensitive species are considered stable. Habitat for sensitive species associated with scabland (lithosol soils) has changed little in the last few decades and is expected to remain in their current condition. In some areas riparian improvement projects, such as protection fencing, planting, headcut (stream channel) repair and development of riparian pastures appear to have enhanced or expanded habitat for sensitive species associated with riparian areas.

On upland sites, long-term effects of no action would be a trend towards increased juniper densities, further reducing available habitat for *Astragalus peckii*. However, given the lack of moisture and inherent low productivity of associated habitat, this trend may take several more decades before any measurable change can be observed. With even lower productivity on scabland sites associated with *Achnatherum hendersonii* and *A. wallowaensis*, habitat would change even more slowly.

Impacts from increased recreation and other uses are not foreseen on sensitive plant habitat. Development of private lands for houses, etc. may increase long-term risk to the viability of

Astragalus peckii but does not pose an immediate threat. Therefore, cumulative impacts are not expected to change the direct and indirect effects described previously.

Prescribed burning projects not occurring as a part of this project could result in increased exposed soils which can increase susceptibility to noxious weed infestation and spread. This risk increases when prescribed fires become intense on drier soils as often occurs in August and September. Design elements include less intense burning prescriptions to reduce adverse effects. Burning can also improve forage production and palatability, leading to increased livestock use on burned areas. If these areas burn too hot, or if livestock grazing occurs before there is sufficient recovery of vegetation and the soil organic layer, grazing can impact these areas by compacting and displacing soil, increasing the risk of riparian degradation and increase the risk for introduction and spread of noxious weeds. This could affect sensitive plants and habitat. With incorporation of design elements burning is not expected to have any cumulative impact on viability of riparian or upland sensitive plant species or their habitats. Areas where prescribed burning would take place are expected to re-vegetate quickly and become less susceptible to non-native noxious weeds. Project design criteria to rest pastures for two years minimum following prescribed burning would minimize the risk of weed infestation and spread.

Wildfire suppression on the Grassland generally avoids construction of fire lines, using instead natural fuel breaks such as ridge tops or human-created breaks such as roads. This practice reduces the amount of soil disturbance associated with wildfire suppression and prescribed burning projects, therefore reducing opportunities for weed establishment and spread.

No effect is expected on sensitive plant species associated with scablands. Scablands have inherently very low fuel levels. These sites are generally not affected by prescribed burning.

Sensitive plant habitat associated with upland areas is generally in plant communities that have historically been maintained by periodic fire. The Eyerly, Geneva II, and B&B wildfires occurred within and adjacent to the analysis area. The B&B Complex fire perimeter contains primarily higher elevation, forested habitats, and so has few areas of suitable habitat for the Sensitive plant species discussed here. The Eyerly and Geneva II fires are lower-elevation, but assuming noxious weed control is implemented and effective, fire effects are not expected to affect viability of sensitive plant species for at least the next decade. These fires are not expected to warrant any changes to the status of sensitive plant species discussed here.

For sensitive plant species suspected of occurring on the Grassland, range-monitoring data indicates most habitats on public lands currently appear stable. Exceptions occur where invasive plants (noxious weed infestations) have expanded, primarily along heavily disturbed areas such as old town sites, roadsides, and utility corridors. Noxious weeds currently do not appear to threaten the viability of sensitive plants or any other native plant species for at least the next decade. Projecting potential expansion beyond this time period is not possible due to the many variables such as wildfire, availability of herbicides, etc. Expansion of *Juniperus occidentalis* (western juniper) is also occurring, but is currently does not appear to be affecting viability of sensitive plants or any other native plant species, nor is it expected to for at least the next decade.

Currently noxious weed infestations contribute little to sensitive plant habitat loss. Aside from medusahead, most weed infestations are currently being controlled under the 1998 Integrated Weed Management Plan. Assuming control measures continue noxious weeds are expected to have no measurable effect on sensitive plants over the next decade.

The Forest Service Region 6 office is currently completing an Environmental Impact Statement for treatment of noxious weeds. This may include additional treatment opportunities on the Grassland for integrated noxious weed management. Implementation of additional weed management resulting from the Invasive Plant EIS is expected to have little short-term effect on sensitive plant

species and may have long-term beneficial effects, as more tools are available to treat noxious weeds.

Other activities such as mineral materials extraction, installation and maintenance of fences, and utility line and road maintenance are primarily in areas with low probability of occurrence for sensitive plant species (i.e. pipelines), or are inherently of low impact to habitat (fence maintenance). Effects from these activities are expected to have little to no effect on habitat or populations of these species.

No proposed, endangered, or threatened plant species are present in the analysis area. Habitat is not present; therefore there would be no effect on any proposed, endangered, or threatened plant species under any alternative.

3.8.3 PETS Aquatics

3.8.3.1 Affected Environment

Please refer to Fisheries and Hydrology (Section 3.6.2) for descriptions regarding current habitat condition and over-all watershed condition. This section will pertain specifically to fish presence and distribution.

Following is a discussion for bull trout (listed threatened by the U.S. Fish and Wildlife Service), redband trout and Columbia spotted frog (listed sensitive by the Pacific Northwest Region) and for habitat for Mid-Columbia River steelhead trout (listed threatened by the National Oceanic and Atmospheric Administration (NOAA)), Mid-Columbia River spring-run chinook salmon (listed sensitive by the Pacific Northwest Region) and Mid-Columbia River spring-run chinook salmon EFH (essential fish habitat) determined by the Pacific Fishery Management Council.

<u>3.8.3.1.1 Willow Creek Watershed</u>

3.8.3.1.1.1 Bull trout (Salvelinus confluentus).

Bull trout are not known to occupy Willow Creek Watershed.

3.8.3.1.1.2 Redband trout (Oncorhynchus mykiss mykiss)

The current presence of redband trout suggests a population was present during pre-settlement times. Populations may have been more vigorous prior to irrigation withdrawals; however, it is probable that in dry years redband trout populations migrated to spring areas with consistent flow and cooler water. Redband trout were reported seen by the District Hydrologist in 2003 in Willow Creek at the Forest boundary and in the tributaries to Willow Creek.

3.8.3.1.1.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss),* Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run chinook salmon EFH (*Oncorhynchus tshawytscha*)

Historical information pertaining to steelhead trout, chinook salmon, and chinook salmon EFH in this watershed is not known.

3.8.3.1.1.4 Columbia spotted frog *(Rana luteiventris)*

No historic information on the Columbia spotted frog is available for the Willow Creek Watershed. Spotted frog surveys conducted by the Bonneville Power Administration for the Pelton Round Butte Dam Relicensing process found Columbia spotted frogs in and around Rimrock Springs. Population abundance information is not known and no other populations were found within the Willow Creek Watershed (David, 2003). Habitat may be present near Rimrock Springs.

3.8.3.1.2 Whychus Watershed

3.8.3.1.2.1 Bull trout (Salvelinus confluentus).

Bull trout are known to inhabit Squaw Creek from Alder Springs to its confluence with the Deschutes River. Bull trout reside as adults and juveniles but spawning activity has not been observed (Grover, 2003).

Bull trout are known to migrate from the Metolius River and Lake Billy Chinook Reservoir and are considered part of the Metolius River population. No trends in bull trout populations are currently available in Squaw Creek but the Metolius River bull trout population is believed to be increasing or stable and at low risk for extinction (Lichatowich, 1998).

3.8.3.1.2.2 Redband Trout (Oncorhynchus mykiss mykiss)

Biologists from the Sisters Ranger District on the Deschutes National Forest sampled redband trout in 1999 along Squaw Creek from River Mile 0 to River Mile 15 using USDA Forest Service snorkeling and electro fishing protocols. Estimates of fish densities within the analysis area were as high as 32 fish per 1000 square feet in September of 1999. Reported densities may have been exaggerated during this month because of the low water levels that tend to concentrate fish in the remaining pools.

Bi-weekly snorkel surveys completed during 1999 as part of a study done by Oregon State University for Portland General Electric (PGE) recorded spawning activity in two peaks in May and July (Shields, 1999). The July peak occurred following high flows from snow melt runoff.

The number of redds observed during 1998 and 1999 were as high as and as low as three.

One hundred and fifty adult redband trout were observed in 1999 during the spawning run up Squaw Creek. No recaptures or re-observations of spawning fish tagged in Squaw Creek have been conducted in the main stem of the Deschutes River. Fish tagged in the Deschutes River and near the Round Butte Dam have been observed on spawning grounds in Squaw Creek (Shields 1999).

3.8.3.1.2.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss),* Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run Chinook salmon EFH (*Oncorhynchus tshawytscha*)

Squaw Creek was once a primary spawning stream for wild steelhead trout. Within the watershed boundary from the confluence to River Mile 12, Frey (Frey 1942) observed that the lower canyon portion of Squaw Creek was probably of little value to salmon. However, a conflicting report by Nehlsen states that this reach had excellent spawning gravel (Nehlsen, 1995).

In 1951, the Oregon State Game Commission (OSGC) biologists found steelhead spawning in the lower reaches of Squaw Creek, except below River Mile 1 where chinook salmon were found spawning (Nehsen 1995). Index counts conducted in the 1950's reported steelhead spawners numbered from 62 (incomplete) to 619 in 1953.

Abundance estimates conducted by Montgomery and cited by Nehlsen reported a minimum of 582 steelhead used Squaw Creek in 1951 and 1,000 in 1953 (Nehlsen 1995). Index counts conducted in the 1960s showed spawners dwindling in number.

Spring chinook salmon utilized lower Squaw Creek until the middle to late 1950s. Counts of adult chinook salmon conducted in lower Squaw Creek found consistent numbers of spawning fish and redds in the lower few miles in the early 1950s. Populations of chinook salmon declined markedly

from 3 to 20 fish prior to 1956, to 0 to 4 fish and 0 to 2 redds from 1957 to 1960 respectively (Nehlsen 1995).

Chinook salmon and steelhead trout have been extirpated from Squaw Creek due to passage problems over the Pelton Round Butte Dam Complex. Essential fish habitat is known to be in Squaw Creek.

3.8.3.1.2.4 Columbia spotted frog *(Rana luteiventris)*

Surveys conducted by the Bonneville Power Administration to determine distribution of Columbia spotted frogs revealed none were present at the time surveys were conducted along Squaw Creek (David, 2003).

3.8.3.1.3 Mud Springs Watershed

3.8.3.1.3.1 Bull trout (Salvelinus confluentus).

Historically, Mud Springs Creek had no natural barriers preventing fish movement into the watershed except where there were subsurface flows. There is no available evidence indicating bull trout were historically present in Mud Springs Creek.

3.8.3.1.3.2 Redband Trout (*Oncorhynchus mykiss mykiss*)

Redband trout reside in the upper Mud Springs Creek, within both allotments on the Grassland. This section of channel provides the only cool perennial flow in Mud Springs Creek.

Habitat loss for redband trout in lower Mud Springs Creek and degraded channel conditions at Mud Springs have probably fragmented the population. Isolated fish populations can be found in fragmented streams. This remnant redband trout population is at high risk for further decline.

No formal aquatic resource surveys are available for Mud Springs Creek.

3.8.3.1.3.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss),* Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run Chinook salmon EFH (*Oncorhynchus tshawytscha*)

Maps produced by Lichatowich (Lichatowich, 1998) for Portland General Electric, suggest the Mud Springs Creek Watershed has the potential to support anadromous fish.

Historically, Mud Springs Creek had no natural barriers preventing fish movement into the watershed except where there were subsurface flows. There is no available evidence indicating anadromous fish were historically present in Mud Springs Creek.

Chinook salmon and steelhead trout and their habitat are not known to have occurred in the Mud Springs Creek Watershed.

3.8.3.1.3.4 Columbia spotted frog *(Rana luteiventris)*

Surveys have not been completed. Field observations for Columbia spotted frogs have not been able to locate Columbia spotted frogs within the Mud Springs Creek Watershed (David, 2003).

3.8.3.1.4 Deschutes South Watershed

There are no fish bearing waters containing threatened, endangered, or sensitive species within the Grassland portion of this Watershed.

3.8.3.1.5 Steelhead Watershed

3.8.3.1.5.1 Bull trout (Salvelinus confluentus).

Historically, bull trout adults may have followed salmon, steelhead, and resident redband trout into this area to prey on them. Deep pools, ledges, large angular rock, a fringe of riparian vegetation along channel margins and emergent aquatic plants provide complex cover needed by bull trout.

Bull trout may still inhabit the middle section of the Deschutes River up to Steelhead Falls, although few bull trout have been observed. The Deschutes River, from Steelhead Falls to the North Unit of the main canal, is on the State 303d list for temperature, flow modification, and pH. Poor water quality and the lack of an adequate prey base may contribute to the low numbers of bull trout in this watershed.

3.8.3.1.5.2 Redband Trout (*Oncorhynchus mykiss mykiss*)

In 1994, the population of resident redband trout was estimated to be 3,002 per mile between Big Falls and Lake Billy Chinook (Shields et al. 1999).

3.8.3.1.5.3 Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run Chinook salmon EFH (*Oncorhynchus tshawytscha*)

Chinook salmon migrated through the lower Deschutes River from April through October, with peaks in May and late September or early October. Pelton Dam project records from 1959-1962 indicated the peak movement of adult chinook salmon occurred during May, with a small peak in September (Nehlsen 1995).

In the first spawning surveys conducted in 1951, no spring chinook salmon were observed spawning in the Deschutes River above the mouth of Squaw Creek. Four spring chinook salmon were caught in a follow-up survey at Steelhead Falls in 1953, indicating possible spawning (Nehlsen 1995).

Spring chinook salmon no longer inhabit the watershed. The Pelton Round Butte Dam Complex, although installed with a fish ladder, contributed to the decline and extirpation of anadromous salmonids in the watershed. Anecdotal accounts suggest there may still be some adfluvial (movement between lake and stream) chinook salmon moving into these reaches from Lake Billy Chinook. Essential fish habitat is considered present in the Steelhead Watershed.

3.8.3.1.5.4 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss)*

This segment of the Deschutes River historically supported runs of both fall and spring steelhead trout (Frey 1942). The majority of steelhead entered the Deschutes River as adults in late July through October (King 1966). Counts of adult steelhead at Pelton Dam from 1957-1965 suggest that adults likely migrated through the Pelton site downstream of the watershed reach throughout the year, with peaks in July, late fall and early spring. Gunsolus and Eicher (Gunsolus and Eicher 1962) reported that steelhead trout passing above Pelton Dam were predominantly 4 years old. Spawning occurred mainly in March and April below Big Falls. Downstream migration occurred mainly from early April through July (Oregon State Game Commission 1960).

Big Falls was considered the upstream limit of migration under natural flow conditions (Nehlsen 1995). Steelhead trout were apparently able to negotiate Steelhead Falls during high flows, but after a fish ladder was constructed in 1922, steelhead trout could move upstream into some excellent gravel areas between Steelhead Falls and Big Falls. Ultimately, irrigation withdrawals reduced flows to a point where steelhead trout could not negotiate the ladder. Three hundred cubic-feet-per-second (cfs) is believed to be the lowest flows can be reduced near Bend, Oregon, to

assure enough flow over the ladder at Steelhead Falls (Lichatowich 1998). After 1930, these flows were only available from November through April.

Steelhead trout no longer inhabit the Steelhead Watershed. The Pelton Round Butte Dam Complex, although installed with a fish ladder, contributed to a decline and extirpation of anadromous salmonids in the watershed. Anecdotal accounts suggest there may still be some chinook salmon moving in this reach from Lake Billy Chinook.

3.8.3.1.5.5 Columbia spotted frog *(Rana luteiventris)*

Historic information on the Columbia spotted frog is not known. Spotted frog surveys conducted by the Bonneville Power Administration for the Pelton Round Butte Dam Re-licensing process have not found spotted frogs in the Steelhead Watershed. No population abundance information is available and no other populations were found within the watershed (David 2003).

3.8.3.1.6 Lake Billy Chinook Watershed

3.8.3.1.6.1 Bull trout (Salvelinus confluentus)

The bull trout population in the Deschutes River is considered a part of the Metolius River population. Bull trout are known to move through Lake Billy Chinook Deschutes Watershed to rear in Squaw Creek, near Alder Springs. It is likely bull trout live in the colder waters of the Deschutes Arm of Lake Billy Chinook, feeding on the existing prey base of kokanee salmon, redband trout, brown trout, and various rough fish (i.e., white fish) available to them.

The Metolius bull trout population is considered stable (Lichatowich 1998). It was listed as threatened by the US Fish and Wildlife Service throughout its range in 1998.

3.8.3.1.6.2 Redband trout (*Oncorhynchus mykiss mykiss*)

In 1994, the population of resident redband trout was estimated to be 3,002 per mile between Big Falls and Lake Billy Chinook (Shield 1999).

3.8.3.1.6.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss),* Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run chinook salmon EFH (*Oncorhynchus tshawytscha*)

Steelhead trout and chinook salmon have been extirpated from the Lake Billy Chinook Deschutes Watershed upstream of the Pelton Round Butte Dam Complex. Passage over the dams is in the planning stages but hasn't occurred. Essential fish habitat is known to be present.

3.8.3.1.6.4 Columbia spotted frog *(Rana luteiventris)*

No historic information on the Columbia spotted frog was available. Population abundance information is not known and no other populations were found within the watershed (David, 2003).

3.8.3.1.7 Crooked River Grassland Watershed

3.8.3.1.7.1 Bull trout (Salvelinus confluentus).

Bull trout have been extirpated from most of the river although some individuals are periodically observed downstream of the Opal Springs Dam at River Mile 7 on the Crooked River. There are no known current observations of bull trout above the Opal Springs Dam. Abundance of bull trout is unknown within the river.

3.8.3.1.7.2 Redband trout (*Oncorhynchus mykiss mykiss*)

The lake environment created by impounding the Crooked River Arm of Lake Billy Chinook up to RM 6 has likely altered resident fish communities such as native redband trout, which is more

accustomed to river environments. Inter-basin migration of redband trout between the Deschutes, Metolius, and Crooked Rivers may have been altered when these river systems were impounded (Shields, 1999). Redband trout populations are fragmented and depressed in part due to low flows caused by stream diversions (DEQ, 2002).

Redband trout spawning migration counts up the Opal Springs fish ladder were made in 1998 and 1999 (Shields 1999). Counts of up to six fish per day indicate fish moving up the ladder were mature and probably on a spawning run. Snorkel surveys on the main stem of the Crooked River below the Opal Springs diversion dam also indicated large numbers of redband gathering from May through late July. No spawning was observed in the Crooked River; the authors (Shields 1999) were unsure of the origin of these redband trout. No other information is available on the abundance and distribution of redband trout within the watershed.

3.8.3.1.7.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss),* Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run Chinook salmon EFH (*Oncorhynchus tshawytscha*)

Steelhead trout and chinook salmon were extirpated from the watershed following the construction of the Pelton Round Butte Dam Complex. Habitat conditions for spawning and rearing were rated as fair to good within the river based on the HABRATE model (USDA, 2001). Adult holding habitat for both species is rated as good based on results from the HABRATE model.

Following a re-fitting of the Opal Springs Dam in 1982 (RM 8), the dam became a complete block to salmonid movement (Stuart, 1996). As part of the re-licensing process for the Pelton Round Butte Dam Complex (Portland General Electric 1999), passage over the Opal Springs Dam was modeled using HABRATE. Modeling runs with and without passage yielded a mean run size of 297 adult chinook, (without passage) and 1,768 adults (with passage) over the Opal Springs Dam (Portland General Electric 1999). Increasing habitat quality over a 50-year model run increased the average spawning run size from 1,045 adult chinook salmon to 1,768 adult chinook salmon (Portland General Electric 1999). No comparable information was available for steelhead trout.

Chinook salmon EFH is considered present within this watershed.

3.8.3.1.7.4 Columbia spotted frog *(Rana luteiventris)*

Surveys conducted as part of the Pelton-Round Butte Dam Re-licensing, revealed no presence of spotted frogs within the Crooked River (David 2002 and Portland General Electric 1999).

3.8.3.1.8 Lower Crooked River Valley Watershed

No fish species are know to occur in the Lower Crooked River Valley Watershed on the Grassland. There is no known chinook salmon EFH within the watershed**.**

3.8.3.1.8.1 Columbia spotted frog *(Rana luteiventris)*

Limited field reconnaissance was conducted on selected high probability reaches of Skull Hollow in the spring of 2003 to determine the presence or absence of spotted frog adults, tadpoles, or egg masses. No spotted frogs were found during this survey.

3.8.3.1.9 Lower Lake Billy Chinook Watershed

3.8.3.1.9.1 Bull trout (Salvelinus confluentus).

Bull trout prefer habitat with low water temperature (<50 degrees F), stable annual flows, high stream channel complexity and an excellent food base (USDA 1997). Bull trout were historically found throughout most of the Deschutes Basin (Ratliff and McCollister 1996). Bull trout are

known to be in the Metolius River, the Deschutes River up to Big Falls and the Crooked River up to Opal Springs Dam (ODFW 1997).

3.8.3.1.9.2 Redband trout (*Oncorhynchus mykiss mykiss*)

No data or reports were available on historical redband distribution and abundance. Redband trout can be found in a variety of fast and slow water environments on the Metolius River. Spawning habitats for redband would have been limited in this reach because of the high gradient and deep riffles in this watershed.

3.8.3.1.9.3 Mid-Columbia River steelhead trout (*Oncorhynchus mykiss)*

Historic use of the Metolius River by steelhead trout is unclear. Frey (1942) and Nielson (1950) reported spring and fall run steelhead used areas along the Metolius River for spawning. Other authors have reported steelhead spawning but an attempt to verify reports of steelhead found the claims to be unsubstantiated (Montgomery 1951). Montgomery believed large rainbow trout might have been mistaken for anadromous steelhead (Nehlsen 1995).

3.8.3.1.9.4 Mid-Columbia River spring-run Chinook salmon (*Oncorhynchus tshawytscha*) and Mid-Columbia River spring-run Chinook salmon EFH (*Oncorhynchus tshawytscha*)

The Metolius River was considered a major spring chinook salmon spawning and rearing area of the upper Deschutes Basin (Davidson 1953). Early explorers (1855 and 1874) reported that salmon were very abundant but mainly confined to the upper ten miles of the river. Within the Lower Billy Chinook Metolius reach the fast moving and steep channel precluded chinook spawning and rearing, although it was a corridor for passage to the upper Metolius River (Nehlsen 1995 and Lichatowich 1998). Chinook salmon EFH is present in this watershed.

3.8.3.1.9.5 Columbia spotted frog *(Rana luteiventris)*

Historic information on the Columbia spotted frog is not available. No population abundance information is available and no other populations were found within the watershed (Portland General Electric 1999 and David 2000).

3.8.3.1.10 Hay Creek Watershed

There are no known threatened, endangered, or sensitive aquatic species within this watershed. Less than 20 percent of the lands within the watershed are within the administrative jurisdiction of the Grassland. Non-Grassland lands have not been surveyed for aquatic species.

3.8.3.2 Environmental Effects

3.8.3.2.1 Direct and Indirect Effects

Table 3-55 Determination of Threatened, Endangered, and Sensitive Aquatic Species

Species	TES Species Determination				
	Listing	Alternative A	Alternative B	Alternative C	Alternative D
redband trout *Oncorhynchus mykiss mykiss*	Sensitive	MIIH	NI	MIIH	MIIH
***Mid-Columbia River steelhead trout** *Oncorhynchus mykiss*	Threatened	NE	NE	NE	NE
bull trout *Salvelinus confluentus*	Threatened	NLAA	NE	NLAA	NLAA
***Mid-Columbia River spring-run chinook salmon** *Oncorhynchus tsawytshcha*	Sensitive	NI	NI	NI	NI
Mid-Columbia River spring-run chinook salmon EFH *Oncorhynchus tsawytshcha*	Sensitive	NLAA	NI	NLAA	NLAA
Malheur mottled sculpin *Cottus bairdi malheurensis*	Sensitive	NI	NI	NI	NI
Columbia spotted frog *Rana luteiventris*	Sensitive	MIIH	NI	MIIH	MIIH
Westslope cutthroat trout *Oncorhynchus clarki lewisi*	Sensitive	NI	NI	NI	NI

Mid-Columbia River steelhead trout and Mid-Columbia River spring-run chinook salmon are listed as having **no effect** and **no impact** to these species. At the time of this decision notice, these fish do not have passage over Pelton Round Butte Dam Complex and access into the project area. In the future, within the next five to ten years, these fish could have passage through the Federal Energy Relicensing Commission decisions.

Determination for Federally Listed Species

- NE no effect
- LAA may effect - likely to adversely affect
- NLAA may effect - not likely to adversely affect
- BE beneficial effect

Determination for Sensitive Species

- NI no impact
- MIIH may impact individuals or habitat, but would not likely contribute to a trend towards federal listing or loss of viability to the population or species
- WIFV would impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species
- BI beneficial impact

*Trigger for a Significant Action As Defined In NEPA
** Note: Rationale for conclusion of effects is contained in analysis.

3.8.3.2.1.1 Alternative A

Livestock grazing does not currently occur in riparian areas except in the Windom and Springer Pastures in the Juniper Butte Allotment. Over the past 20 years these two pastures were used approximately every other year by livestock. Within these two pastures the actual springs and seeps are fenced from livestock use. Wildlife grazing would continue.

Juniper has expanded beyond its historic range of variability. No juniper management may allow further juniper expansion. Indirect effects include potential loss of grass/shrub under story as juniper canopy increases because of lack of treatment. Grass/shrub under story acts to filter sediment, reducing the amount of sedimentation that enters streams. This would provide a chronic sediment source downstream from the uplands.

Without livestock grazing, there would be an increase in vegetation height that could increase the spread of wildfire, carrying it to ladder fuels and tops of trees. Vegetation where trailing occurs by livestock in class IV streams would revegetate, providing increase in filtering vegetation in the uplands.

Direct effects on unfenced Class 4 intermittent riparian zones and aquatic resources would occur under this alternative because livestock grazing would be removed on the Grassland. Riparian vegetation would not be eaten or trampled except by wildlife. Stream banks would be protected and no stream bank shearing or post holing may occur except by wildlife.

Removing livestock grazing would allow faster geomorphic recovery of intermittent and ephemeral streams providing water, sediment, and nutrients down stream to perennial aquatic environments. Intermittent and ephemeral streams would become stable over the long term, in the order of 10s to 100s of years without grazing.

Sediment above the historic range of variability (1850 baseline) would continue to be generated by ephemeral and intermittent streams over the long term in areas outside of the Grassland that would continue to have livestock grazing.

It is unknown whether loss of groundwater flow due to expansion of juniper can reduce stream flows to a measurable level in fish bearing streams. Belsky (1996) notes that most observations of reduction in flow from springs are anecdotal and further study is necessary. Long-term anecdotal evidence from range specialists on the Grassland suggest there have been localized increases of flow from springs that have had juniper removed (Adams, 2003).

The indirect effect of juniper expansion within the Squaw Creek Watershed may contribute to localized reduction of water contributing to seeps and small springs. The groundwater flows contributing to Squaw Creek within the Holmes-Squaw Creek Allotment are large and regional in source area. Aquatic resources in Squaw Creek are unlikely to be affected measurably by changes in groundwater flow resulting from juniper expansion within that watershed.

Expansion of the juniper population may influence the erodability of soils by out-competing grasses and shrub ground cover for water and nutrients. Loss of ground cover under a juniper canopy and changes in soil infiltration may increase erodability of sites occupied by juniper. It is possible that soil erosion and sediment transport to perennial streams could increase as juniper over story increases and grass/shrub under story declines (Buckhouse, 1999). The sedimentation transported is not likely to be measurable. The magnitude and intensity of erosion attributed to juniper expansion is unknown and disputed. The indirect consequence of erosion from uplands and intermittent channels to aquatic environments could be a chronic supply of fine sediment.

Wildfire could also increase erodability of sites depending on the opportunity for establishment of vegetation after the fire and during seasonal rainfall. Potential for erosion could occur during unseasonal heavy storm events. During normal seasonal rainfall following a fire it is unlikely for sediment to be measurable in streams. Wildfire is likely to occur in mosaic patterns throughout the project area.

The risk to aquatic species would be low and approximately the same as Alternative B. In Alternatives A and B, grass/shrub under story could decline as juniper over story increases;

however, grass/shrub under story could be consumed by livestock and wildlife under Alternative B, having a similar erosion possibility on the uplands and intermittent channels.

Aquatic species considered for Alternative A are redband trout, Columbia spotted frogs, Mid-Columbia River spring-run chinook salmon, Mid-Columbia River spring-run chinook salmon EFH, Mid-Columbia River steelhead trout and bull trout in Steelhead, Whychus and Lake Billy Chinook Watersheds; redband trout and Columbia spotted frogs in Willow and Mud Springs Creek Watersheds; redband trout, Columbia spotted frogs, Mid-Columbia River spring chinook spring-run salmon, Mid-Columbia River spring chinook spring-run salmon EFH and Mid-Columbia River steelhead trout in Crooked River Grassland and Lower Lake Billy Chinook Metolius Watersheds. No aquatic species known to occur in Lower Crooked River Valley, Deschutes South, and Hay Creek Watersheds. This includes rainbow trout management indicator species. Effects to these species in these watersheds would not likely have a measurable affect by removing livestock grazing from the Grassland.

3.8.3.2.1.2 Alternative B – Current Management

Grazing would continue as it presently is.

In Alternative B, there would be 92 percent of the Grassland open to grazing by livestock. With current livestock grazing on the Grassland, most of the streams with perennial flowing water (class 1, 2, and 3 streams) are protected by fencing or cliffs from livestock grazing. Exceptions would be in Windom and Springer Pastures in the Juniper Butte Allotment where the riparian areas (RHCA) is used as a riparian pasture and grazed every few years for control of grasses for wildlife cover habitat. Except in riparian pastures, riparian vegetation would not be eaten or trampled by livestock. Stream banks are protected and no shearing or post holing would occur except by wildlife.

Current adaptive grazing management provides protection to perennial streams and springs through the use of riparian pastures and off-channel watering sites.

Direct effects of sedimentation from grazing in riparian pastures would not be measurable in streams. Indirect effects of grazing on aquatic resources are low risk because of the current stable or upward range trend in uplands and protected riparian zones. Possible sources of sediment from grazing could include trailing or bank shearing along intermittent streams (class IV). In addition, sediment and runoff is generated from existing roads and existing grazing by wildlife. In class IV streams that are in close proximity of perennial flowing water there is a high probability of sediment entering streams.

No direct effects on riparian zones and aquatic resources would occur under this alternative because domestic livestock are not grazing within riparian zones (although grazing by wildlife does occur) except in riparian Windom and Springer Pastures in the Juniper Butte Allotment.

Current adaptive grazing management within the Willow Creek watershed provides protection to perennial streams and springs through the use of riparian pastures and exclosures, and off-channel watering sites.

No grazing is planned for Willow Creek.

In the Whychus Watershed, the Squaw Creek pasture has been in non-use for four years. It would remain closed to use to protect scenic river values and threatened bull trout.

The effects of grazing on aquatic resources present a low risk because of the current stable or upward range trend in uplands and protected riparian zones. In the Deschutes South Watershed,

aquatic resources are limited to two drainages that drain into Haystack Reservoir. The reservoir is fenced to preclude grazing.

Squaw Creek, Canadian, Bench, Lower Desert (except East and West Winter), Clevenger, Goldmine Falls, and Peninsula are currently vacant or closed to grazing and would remain so.

In the Mud Springs Creek Watershed the effects of grazing on aquatic resources present a moderate risk because most riparian areas are fenced to exclude livestock grazing. Possible sources of sediment from grazing could occur from trailing or bank shearing along intermittent streams that are already unstable due to past grazing or sediment and runoff from roads and grazing in riparian areas by wildlife. Livestock grazing has been eliminated from Skull Hollow, Lone Pine, Rimrock Spring tributary, and Lithgow Creek exclosures. Any sedimentation resulting from grazing of Class IV (intermittent) streams that are not fenced would be reduced. Vegetation would establish and allow for filtering vegetation where trailing of livestock occurs.

The risk to aquatic species would be low and approximately the same as Alternative A. In Alternative B, livestock consume the grass/shrub understory, and in Alternatives A and B, the grass/shrub understory could decline as juniper overstory increases, having a similar erosion possibility in the uplands and intermittent channels.

Direct effects include livestock use in riparian areas in the Windom and Springer Pastures (no fish exist within these areas) in the Juniper Butte Allotment.

Indirect effects include potential loss of grass/shrub understory as juniper canopy increases because of lack of treatment and sedimentation to downstream sources by potential loss of grass/shrub understory from livestock grazing. Grass/shrub understory vegetation filters sediment, reducing the amount of sedimentation that enters streams. This would provide a chronic sediment source downstream from the uplands.

Fencing or geographic barriers protect RHCAs on Squaw Creek.

With livestock grazing, vegetation height would be reduced; the discontinuity of fuels would not carry wildfire across the landscape but would burn in a mosaic pattern. This would reduce the risk of fire reaching ladder fuels and tops of trees.

Existing sediment sources, such as entrenchment and loss of hydraulic function in the meadow surrounding Mud Springs, would not be affected measurably by existing livestock grazing in Alternative B.

Aquatic species considered for Alternative B are redband trout, Columbia spotted frogs, Mid-Columbia River spring-run chinook salmon, Mid-Columbia River spring-run chinook salmon EFH, Mid-Columbia River steelhead trout and bull trout in Steelhead, Whychus and Lake Billy Chinook Watersheds; redband trout and Columbia spotted frogs in Willow and Mud Springs Creek Watersheds; redband trout, Columbia spotted frogs, Mid-Columbia River spring chinook spring-run salmon, Mid-Columbia River spring chinook spring-run salmon EFH and Mid-Columbia River steelhead trout in Crooked River Grassland and Lower Lake Billy Chinook Metolius Watersheds. No aquatic potential, endangered, threatened, or sensitive species are known to be in Lower Crooked River Valley, Deschutes South and Hay Creek Watersheds. This includes rainbow trout management indicator species. Effects to these species in these watersheds would not likely be affected by the proposed grazing and vegetation management treatments. Any sedimentation would not likely be above baseline condition and would not be distinguishable from existing road and recreation related sediment sources.

3.8.3.2.1.3 Alternative C – Proposed Action and Alternative D

Tables 3-56 and 3-57 display the acreage of each proposed treatment for each alternative by watershed.

Indirect effects include potential reduction of grass/shrub under story vegetation from livestock grazing. This could provide a chronic sediment source downstream from the uplands.

Fencing or geographic barriers protect RHCAs.

Any sedimentation would not likely be above baseline condition and would not be distinguishable from existing road and recreation related sediment sources.

There are more acres (49,027) for juniper treatment by chainsaw, chainsaw/prescribed fire, sagebrush/juniper cover control by prescribed fire/mechanical and seeding treatments/chainsaw proposed in Alternative C than in Alternative D (29,589 acres). Increased juniper treatment would likely increase understory vegetative cover more in Alternative C than D.

The acres for tilling/seeding/fertilizing for the two alternatives are similar: 8,256 acres for Alternative C and 8,343 acres for Alternative D. Since class 1, 2, and 3 streams are fenced there would be no direct effects to aquatic species, however, the planned activities may have an indirect effect on sedimentation entering the streams that would affect water quality and subsequently aquatic species.

There are 82,923 acres open to livestock grazing in Alternative C and 88,085 acres open to livestock grazing in Alternative D. Stream sedimentation could be slightly higher in Alternative C than D; however, the juniper treatment and burning would increase under story vegetation and which would potentially filter sediment. Sedimentation would not likely show a measurable difference in Alternative C and D.

Table 3-56 Acres of Proposed Treatment by Watershed for Alternative C - Proposed Action, CRNG.

Watershed Name	Chainsaw Juniper Acres	Chainsaw Juniper Tilling Seeding Fertilizing Acres	Prescribed Fire Acres	Mechanical	Chainsaw Prescribed Fire	Chainsaw Pile Prescribed Fire Acres
Crooked River Grasslands	3,430	914	62	0	0	0
Deschutes South	3,851	2,907	330	115	0	0
Lake Billy Chinook	3,503	0	871	373	0	2,171
Lower Crooked River Valley	1,562	271	0	0	718	0
Lower Metolius	0	0	0	0	0	0
Mud Springs Creek	2,335	687	1,905	0	662	0
Steelhead	906	0	638	0	0	0
Whychus	706	0	1,750	0	256	0
Willow Creek	10,467	3,562	1,951	0	1,387	0

Table 3-57 Acres of Proposed Treatment by Watershed for Alternative D, CRNG.

Watershed Name	Chainsaw Juniper	Chainsaw Juniper	Prescribed Fire	Mechanical Acres	Chainsaw Prescribed	Chainsaw Pile

	Acres	Tilling Seeding Fertilizing Acres	Acres		Fire Acres	Prescribed Fire Acres
Crooked River Grasslands	2,617	914	62	0	0	0
Deschutes South	1,265	2,907	330	115	0	0
Lake Billy Chinook	130	0	508	373	0	2,171
Lower Crooked River Valley	271	271	0	0	718	0
Lower Metolius	0	0	0	0	0	0
Mud Springs Creek	2,304	687	1,905	0	662	662
Steelhead	103	0	0	0	0	0
Whychus	706	0	0	0	256	0
Willow Creek	3,405	3,561	1,951	0	1,386	0

Chainsaw cutting of juniper and mechanical treatment of rangeland has a very low potential for direct, indirect or cumulative effects on aquatic resources. Vegetative stubble, live roots and plant litter would be left on site to provide ground cover and resistance to soil movement. Due to the distance between proposed activities and perennial streams the risk of additional sediment actually getting into a stream is very low.

Changes to grazing are intended to provide more ground cover and organic matter incorporation into the soil. Like Alternative B, Alternatives C and D would have no direct effects to aquatic resources because livestock are not grazing within riparian zones (exceptions are Springer and Windom riparian pastures), therefore, riparian vegetation would not be eaten or trampled except by wildlife.

Grazing in the Springer and Windom riparian pastures are not likely to generate measurable stream sedimentation, as the pastures are not used on a yearly basis. The vegetation is not consumed to meet stubble height but to enhance and maintain habitat for wildlife. In the Deschutes South Watershed, Lithgow riparian exclosure would be maintained for wildlife habitat.

The indirect effect of sediment generated by cattle grazing levels would be the same or less than for Alternative B because existing vegetative condition is in a stable or upward trend. New stubble height restrictions and pasture rest under Alternatives C and D could only continue to improve vegetative conditions and trends. Under these alternatives the risk to aquatic resources from grazing is low.

Low intensity winter/spring prescribed burns generally have a low risk of creating bare ground and detrimental soil conditions. A low risk for erosion on uplands would result in a low risk for sediment production and subsequent impacts to aquatic resources.

Since topography represents a strong influence on susceptibility to erosion and most of the Grassland is fairly flat, the risk of erosion associated with slope is lower on the Grassland than on more hilly terrain. There may be some localized erosion in some areas because of localized rain events. Short-term effects may be localized increased erosion and deposition of sediment.

Prescribed fire is proposed in the Willow Creek Watershed in the Blanchard Allotment, in the Whychus Watershed in the Holmes-Squaw Creek Allotment, in the Mud Springs Creek Watershed in the North and Fox Allotments, in the Deschutes South Watershed in the Cyrus and Round Butte Allotments, in the Steelhead Watershed in the Clevenger Allotment and in the Lake Billy Chinook

Watershed in the Round Butte Allotment. These areas have steeper slopes, confined intermittent drainages, and heavier fuel loadings than in the flatter areas of the Grassland. Prescribed burns would not be ignited within 300 feet of class 1 and 2 streams, within 150 feet of class 3 streams or within 100 feet of class 4 intermittent streams.

The prescribed fire treatments are generally low intensity winter/spring fires that would be designed to treat from 25 percent to 50 percent of the pasture acreage. Short-term effects may be localized increased erosion and deposition of sediment.

The highest risk of erosion relative to prescribed fire is in the Suicide and West Parkey Pastures because the burns are on steeper terrain adjacent to Mud Springs Creek.

Chainsaw cutting would have no measurable effect on aquatic species.

Tilling, fertilizing and drill seeding is proposed for alternatives C and D on the Boyce, Rush and Steer allotments. Tilling would occur in a mosaic pattern on about 33 percent of selected pastures. Tilling would occur on lands less than ten percent gradient, along the slope contour. Seeding and fertilization would occur immediately following tilling in the fall. Swales and drainages would be avoided. There would be no measurable direct or indirect effects on aquatic resources from tilling, fertilizing, and drill seeding because no sediment is expected from these sites. The distance (from disturbances) to intermittent drainages, needed to transport sediment to perennial streams, is in excess of 1000 feet. This distance makes it unlikely that measurable and detrimental sediment would have an effect on aquatic species unless there was a high intensity storm event (ten year or greater).

The amount of treatment proposed would correlate to the potential for erosion and sediment transport to streams for the time period immediately following the treatment until sediment filtering vegetation is established. Any increase in sediment resulting from project activities would not be distinguishable from sediment generated from existing roads or recreation use.

Because sedimentation would not likely be measurable as a result of tilling, fertilizing, and drill seeding, it is unlikely to have measurable direct or indirect affects on streams downstream from the proposed grazing and treatments.

Fire may have a mosaic effect on the RHCA if fire creeps in and out of the area as it burns. Juniper treatment should enhance and increase under story vegetation that acts to filter sediment. Baseline sedimentation from the uplands that enters streams may be reduced as a result of increased understory vegetation.

Aquatic species considered for Alternatives C and D are redband trout, Columbia spotted frogs, Mid-Columbia River spring-run chinook salmon, Mid-Columbia River spring-run chinook salmon EFH, Mid-Columbia River steelhead trout and bull trout in Steelhead, Whychus and Lake Billy Chinook Watersheds; redband trout and Columbia spotted frogs in Willow and Mud Springs Creek Watersheds; redband trout, Columbia spotted frogs, Mid-Columbia River spring chinook spring-run salmon, Mid-Columbia River spring chinook spring-run salmon EFH and Mid-Columbia River steelhead trout in Crooked River Grassland and Lower Lake Billy Chinook Metolius Watersheds. No aquatic species known to be in Lower Crooked River Valley, Deschutes South, and Hay Creek Watersheds. This includes rainbow trout, management indicator species. These species in these watersheds would not likely be affected by removing livestock grazing from the Grassland.

3.8.3.2.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Cumulative effects from past, present and reasonably foreseeable actions have been considered in the effects for the Crooked River National Grassland FEIS alternatives. From the list of ongoing projects they would not likely cause measurable increase in sedimentation in streams.

Ending livestock grazing (Alternative A) could allow faster geomorphic recovery of intermittent and ephemeral streams providing water, sediment, and nutrients to perennial aquatic environments. Intermittent and ephemeral streams would become stable over the long term, in the order of tens to hundreds of years without grazing. Sediment above the historic range of variability (1850 baseline) would continue to be generated by ephemeral and intermittent streams over the long term.

Juniper is expanding beyond its historic range of variability. Alternative A could result in potential loss of grass/shrub understory as juniper canopy increases because of lack of treatment and juniper expansion

Further expansion of juniper populations into the Grassland may intercept soil moisture contributing to stream flow. The Grassland is in a semi-arid environment where soil moisture is generally deficit. Soil recharge during early spring provides moisture for stream flow.

Treatments proposed in Alternatives C and D would not generate a measurable increase in sedimentation to streams. The treatments are designed to improve vegetative condition and would increase the filtering vegetation in the uplands.

No actions are proposed within riparian areas except for limited riparian grazing in Springer and Windom riparian pastures in the future (Willow Creek Watershed). Fencing or geographic barriers prevent grazing within the RHCA. Elsewhere there is a water crossing on Squaw Creek (Whychus Watershed) but it is not currently being grazed by livestock. A water gap located at Mud Springs Creek would be removed. This would eliminate livestock accessing the stream and protect riparian and aquatic resources under all alternatives.

In the Crooked River Grassland Watershed, bull trout reside in the Crooked River below Opal Springs but outside of allotment boundaries. Bull trout in the Crooked River are part of the Metolius River population that is considered strong (Grover, 2003). Large regional inputs of groundwater flow into the Crooked River in this area maintaining high quality cool water (USGS, 2001). Bull trout also reside in Squaw Creek in the Whychus Watershed. Alternatives B, C and D would not have a measurable effect on bull trout populations.

There would be no direct impact to redband trout, Columbia spotted frog or bull trout species or their habitat, Mid-Columbia River spring-run chinook salmon EFH (essential fish habitat), Mid-Columbia River spring-run chinook salmon and Mid-Columbia River steelhead trout habitat after fish passage through the Federal Energy Re-licensing Commission.

Indirect effects include a sedimentation source to downstream sources by potential loss of grass/shrub understory from livestock grazing. Sedimentation is not likely to be measurable or distinguishable from ongoing sedimentation from roads and recreation activities.

Water withdrawal and sediment from roads are a continuing legacy. The impact from these activities would continue into the foreseeable future. Road maintenance and road decommissioning is expected to continue. Maintaining and decommissioning would move towards reducing sedimentation for aquatic species.

None of the proposed activities (tilling, drill seeding, burning, and juniper cutting) would cause a measurable increase in sedimentation in streams or affect 303d listed streams for temperature (Squaw Creek, Willow Creek and the Crooked River). In the areas where there is hand piling followed by burning, the effects of burning would result in less sedimentation than in burning

across the landscape. In addition, the sedimentation would not be measurable and would have a small affect to streams. Willow Creek is on the State of Oregon 303d list for water temperature; Squaw Creek is on 303d list for water temperature for rearing and spawning; and the Crooked River is on the 303d list for pH, fecal coliform, and temperature. All would be expected to remain on the list.

Prescribed fire would not be started within RHCAs but may creep inside the RHCA. Management actions would take place in the uplands, possibly resulting in some short-term sediment production that would not be measurable over baseline conditions. The following activities would not generate a measurable increase in sedimentation in streams and would not likely affect aquatic species:

- Installation and maintenance of fences associated with springs and wildlife.
- Maintenance of existing utilities, including power lines, pipelines, and communication facilities.
- Mineral material sources to provide material for road maintenance to the Forest Service, Jefferson County, and the Oregon Department of Transportation.
- Suppression of wildfire. The number of acres burned per year over the past 20 years on the Grassland has averaged approximately 2,500 acres.
- Moving juniper to seral conditions closer to the Historical Range of Variability (HRV) through chainsaw cutting of western juniper.
- Deschutes Valley Water municipal water line, to serve the City of Madras, would be constructed on the northwest portion of the Grassland in the next 5 years. This project would cross the Round Butte Allotment.
- Noxious weed control under the 1998 Ochoco National Forest and Crooked River National Grassland Integrated Weed Management Plan. This includes hand pulling and herbiciding of weeds.
- Permitted recreation events, including dog field trials, endurance horse riding events, outfitter guide, cowboy shoot, guided hikes, and bicycle events.
- Wildfire would not likely contribute to sedimentation to streams because the pastures are located on benches high above the streams.

Adaptive range management has improved the upland condition and the riparian zones and the trend is generally upward (Jefferson County, 2001). This would be expected to continue.

Cumulative effects on aquatic resources, if present, would take the form of changes in habitat quality and quantity, changes in water quality and flows, and changes in aquatic species numbers and/or assemblages.

Proposed actions and actions taken on private property (e.g. water withdrawal, riparian grazing) could combine to cumulatively affect aquatic species. The likelihood of negative effects to aquatic species as a result of implementing these proposals is low because water quality, habitat and species issues are presently due to water withdrawal and sediment from dispersed sources (roads) (USDA 2003).

The Crooked River, Deschutes River, and Squaw Creek also have the disadvantage of being at the downstream end of rapidly developing drainage basins in Oregon. If proposed management actions are implemented the effect is more likely to be beneficial as a buffering effect to rapid development. Grazing administration would continue to protect riparian areas and act as refugia during water withdrawal periods.

Private lands located within and adjacent to the Grassland boundary are continually changing ownership. Weyerhaeuser recently sold a large tract of land (over 1,000 acres) within and adjacent to the Lower Desert Allotment. Private in-holdings on the Peninsula Allotment are not being

developed and were open-space in the past. Approximately half of the Holmes Pasture is privately owned and may be developed in the near future.

Development of homes and roads increases the runoff and could increase the erosion rate for Grassland allotments that are downstream from the Lower Desert Allotment and the Holmes Pasture.

Other future actions include:

- Expansion and rehabilitation of the Round Butte material site.
- Fuel management activities for 2004 include 500 acres on the west side of the Grassland, 1,000 acres near Round Butte, and 1,000 acres in the Cyrus Hills.
- Skull Hollow is in need of rehabilitation that would include 1000 acres of vegetation work (primarily juniper control) and two miles of riparian improvement. Associated work would include off-site water development, relocation of fences, possible road obliteration and/or movement; and trail construction or movement.
- The Blanchard well, located in the North Blanchard Pasture of the Blanchard Allotment, has been in operation for over 100 years. It is in need of upgrading either the pump or drilling a new hole.
- Stream and riparian enhancement projects, such as placement of large woody material, is anticipated. Planting of native hardwoods, such as aspen in riparian areas and other hardwood enhancement project is anticipated.
- The Oregon Department of Corrections will build a medium security prison near the administrative boundary of the Grassland near the city of Madras. Construction is expected within the next decade.
- The city of Madras plans to expand their existing water treatment facility within the next decade. The facility is located near the Grassland administrative boundary.
- Juniper within road Right-of-Ways would be cut as needed to ensure public safety.

3.8.4 PETS Wildlife

3.8.4.1 Affected Environment

Ten species are listed as potential, endangered, threatened, or sensitive on the Regional Forester's List for the Ochoco National Forest but only six have potential or existing habitat on the Grassland. There are no species listed as "Proposed" on the CRNG.

None of these ten species are listed as endangered under ESA.

There are two threatened species: northern bald eagle and Canada lynx. Only the bald eagle has potential habitat on the Grassland. Canada lynx will not be discussed further.

There are eight sensitive species: the American peregrine falcon, greater (formerly western) sage grouse, tricolored blackbird, gray flycatcher, pygmy rabbit, bufflehead, upland sandpiper, and the California wolverine.

The bufflehead can be seen on the Grassland but is considered a transitory species that migrates through. There is no reproductive habitat for this species on the Grassland.

There is no habitat for either the upland sandpiper or the California wolverine. These species will not be discussed further.

There is potential habitat for the other sensitive species listed above.

3.8.4.1.1 Northern Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is Federally listed as threatened. It is considered a resident species. The Grassland is within the High Cascades Recovery Zone as described in the Bald Eagle Recovery Plan (USDI 1986).

Bald eagles are usually associated with rivers, lakes, and marshes and require nearby tall trees or cliffs for nesting (Csuti et.al. 1997).

There are no bald eagle nests or roosts on the Grassland. There are four nests and at least one known roost within one and one half miles of the boundary. Two nests (Big Canyon and Lower Desert) are on private land and two (Grizzly Mountain and Canadian Bench) on Bureau of Land Management lands. None of these nests have bald eagle management areas (BEMA) or consideration areas (BECA) associated with them.

Surveys completed from 1997-2003 by the Oregon Eagle Foundation show on average these pairs produced over one young per territory, per year, exceeding recovery goals (Issacs 2002). Information from these same surveys leads us to believe that the population appears to be stable on and adjacent to the Grassland.

WILDHAB estimates approximately 773 acres of existing bald eagle reproductive habitat on the Grassland. The desired range for habitat is 690-1915 acres. The Grassland is currently within HRV for bald eagle habitat.

Haystack Reservoir, Rimrock Springs Wildlife Management Area, and Lake Billy Chinook are the primary foraging sites for the local eagles. They also forage in dry upland sites on the Grassland for a variety of prey species (Zalunardo 2001).

3.8.4.1.2 American Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon is a Region 6 sensitive species and is considered migratory. It was removed from the Endangered Species list on August 25, 1999. In December 2003 a monitoring plan was released, designed to ensure that American peregrine falcons continue to thrive without the protection of the Endangered Species Act.

Nest sites are usually large cliff faces in conjunction with riparian zones, overlooking a fairly open area with an ample food supply (Csuti et.al. 1997). There were nest sites identified on the Grassland in the 1960s; however, none were verified. There are no recent known peregrine falcon sites.

The rimrock surrounding Lake Billy Chinook is the most likely area with suitable cliff faces for nesting. Grassland raptor surveys completed in 1992 showed no active peregrine falcon nests.

Availability of suitable cliff sites is the limiting factor for this bird. Ravens occupy most of the suitable peregrine falcon nest sites in and adjacent to the Grassland. Ravens are highly competitive for peregrine nesting habitat (Zalunardo 2003).

3.8.4.1.3 Greater (formerly Western) Sage Grouse (*Centrocercus urophasianus*)

The sage grouse is a Region 6 sensitive species. It is not covered under a conservation strategy, although plans are currently in the process of being written. It was considered a resident species until it was extirpated from the Grassland in the late 1950s.

On May 2, 2001, the Washington Distinct Population Segment (DPS) was determined to warrant listing. The listing range of this DPS includes all of the Grassland east of the Deschutes River.

On March 19, 2003, a new petition was filed to list the greater sage grouse range-wide by combining existing petitions for the eastern and western populations. The Grassland would be included in a finding associated with this new petition.

Sagebrush/steppe habitat with forb rich swales and meadows generally describes fully functioning sage grouse habitat.

- **Lek habitats (breeding display sites)** are described as open areas (meadows, burns, roads) adjacent to brushy areas for hiding cover. They are typically areas of low cover within vegetation types of low/high sagebrush mosaics.
- **Roost habitat** is described as draws where sagebrush height and canopy closure is greatest.
- **Nesting habitat** is within two miles of leks in stands of big sagebrush with sufficient over story for protection from predators.
- **Juvenile rearing habitat** within the sagebrush/steppe habitat is characterized as wet meadows or green areas that support brood prey, which include succulent forage and insects.
- **Wintering habitat** is characterized as lowlands protected from drifting snow with low and big sage for foraging and roosting.

Sage grouse prefer areas free of raptor perches such as trees and overhead power lines (BLM 2003).

Although sage grouse were extirpated from the Grassland in the late 1950s, potential habitat does exist. There are approximately 33,900 acres of potential sage grouse reproductive habitat on the Grassland. This figure is 20,650 acres below the HRV of 54,500 acres. In July 2003, U.S. Fish and Wildlife Service (USFWS) biologists visited the Grassland to identify suitable sage grouse habitat. They agreed that there were areas of potential habitat but there is very little presently suitable due mainly to: overhead power lines, past farming, reseeding practices, and encroaching juniper, (Cordova 2003).

The largest factor in sage grouse population declines was mass habitat conversion from native sagebrush habitats to cultivated/farmed ground and to crested wheatgrass. Approximately 59,000 acres of the Grassland were dry land farmed, grazed, tilled, and planted by homesteaders. From the 1940s through the 1960s, most of these acres were reseeded to crested wheatgrass and sprayed with herbicide to eliminate shrubs. These activities removed much of the historic sage grouse habitat by removing the sagebrush on which the sage grouse depended. Most of these acres have not returned to suitable habitat.

Other factors in population declines are conifer woodland encroachment, weed infestation, habitat fragmentation by roads and trails, drought and manmade structures (which function as raptor perches) such as power lines, wind turbines, water developments, and fences. Predation from raptors and carnivores on nests and young birds was also a major decimating factor (Zalunardo, 2002).

3.8.4.1.4 Tricolored Blackbird (*Agelaius tricolor*)

The tricolored blackbird is a Region 6 sensitive species. This species is not covered under a conservation strategy and is considered migratory.

This species breeds in freshwater marshes with emergent vegetation (i.e. cattails), in thickets of willows or other shrubs.

Known colonies of tricolored blackbirds breed within one half of a mile from the Grassland boundary in the Lone Pine area (Shunk 2003). They are also listed in a local brochure "Common Birds of the Ochoco Region" (USDA 2001) as occasional in the fall, spring, and summer and uncommon in the winter.

There are no known sightings of tricolored blackbirds on the Grassland. There is suitable reproducing habitat at Mud Springs, Rimrock Springs, Lone Pine Flat, and Haystack Reservoir. These riparian areas are all fenced to exclude cattle grazing. Due to the rarity of marshes and wet areas with cattails, these birds were likely never very common on the Grassland.

3.8.4.1.5 Gray Flycatcher (*Empidonax wrightii*)

The gray flycatcher is a Region 6 sensitive species. This bird is not covered under a conservation strategy and is considered migratory.

This species prefers areas with tall sagebrush, bitterbrush or mountain mahogany communities. They can occupy these communities within open forests of ponderosa and lodgepole pine. They also inhabit juniper woodlands with a well-developed sagebrush under story (Csuti et.al. 1997).

Gray flycatchers inhabit many areas of the Grassland. Surveys completed during the summer of 2003 found gray flycatchers nesting and foraging on the edge between juniper woodlands and openings with grass and shrubs. They seem to nest in the juniper and forage in the openings adjacent to their nests (Shunk 2003).

WILDHAB estimates approximately 48,183 acres of existing gray flycatcher reproductive habitat on the Grassland. The HRV ranges from approximately 66,555 to approximately 124,417 acres. The Grassland is presently below HRV for this species.

3.8.4.1.6 Pygmy Rabbit (*Brachylagus idahoensis*)

The pygmy rabbit is a Region 6 sensitive species. This rabbit is not covered under a conservation strategy and is considered a resident species.

On April 1, 2003, the USFWS was petitioned to list the pygmy rabbit "occurring in the coterminous Intermountain and Great Basin region as Threatened or Endangered under the Endangered Species Act 16 U.S.C 1531 seq."

Pygmy rabbits are closely tied to habitats dominated by big sagebrush on deep friable soils (Verts et al. 1998). Availability of forage, security from predation, and ease of burrow construction are important habitat characteristics for these small rabbits. They feed primarily on big sagebrush, with grasses and forbs making up the rest of the diet. Occupied sites have higher shrub canopy cover (average of 43 percent) and shrub heights (7 – 22 inches tall) than unoccupied areas. In general, their habitat is characterized by "evenly distributed, tall, big sagebrush with dense canopies" (Katzner 1997).

The last pygmy rabbit sighting on the Grassland was in 1992. There are sites with potential habitat in several areas on the Grassland.
An intensive survey of the last known site was completed in April 2003. There were positive signs that there may be at least one active pygmy rabbit burrow left in that area.

WILDHAB estimated approximately 29,866 acres of existing pygmy rabbit reproductive habitat on the Grassland. The HRV ranges from approximately 38,170 to approximately 64,344 acres. The

Grassland is currently below HRV for this species. However in addition to good sagebrush fields, pygmy rabbits require deep, un-compacted soils, usually found in swales. Not all of the above acres would provide good burrowing habitat.

There are many reasons for pygmy rabbit declines on the Grassland. Large acreages of sagebrush were converted by past dry land farming, grazing, tilling, and burning. Seeding of non-native grasses and shrub spraying after the abandonment of the homesteads and farms delayed the recovery by native grasses and sagebrush. Farming practices also heavily compacted soils in bottomlands that prevented burrow excavation (Zalunardo 2003).

Recovery of native vegetation, particularly sagebrush, has also been hindered by repeat fires, both prescribed and natural.

3.8.4.1.7 Bufflehead (*Bucephala albeola*)

The bufflehead is a Region 6 sensitive species. This duck is not covered under a conservation strategy and is considered migratory.

The bufflehead nests near deep mountain lakes surrounded by open forested areas containing snags (Csuti et.al. 1997). Natural nesting sites are cavities in trees close to water. Aspens are the preferred nest tree, but it will also nest in ponderosa pine and Douglas fir (Marshall et al., 1992). In Oregon, breeding occurs primarily in the central Cascade Lakes region, more than 20 miles from the Grassland (Marshall et al. 1992).

The Crooked and Deschutes Rivers, Lake Billy Chinook, Haystack Reservoir, and Rimrock Springs are places migrating buffleheads stop to rest and forage on the Grassland. No suitable breeding, rearing, or nesting habitat exists in these areas. This species is a winter resident at Lake Billy Chinook, but not found in the summer (Marheine pers.comm. 2003).

3.8.4.2 Environmental Effects

3.8.4.2.1 Direct and Indirect Effects

Table 3-58 below displays the effects determinations for the proposed (P), endangered (E), threatened (T), and sensitive (S) species with potential/existing habitat on the Grassland.

Table 3-58 The short and long term effects determinations for the proposed (P), endangered (E), threatened (T), and sensitive (S) species with potential/existing habitat on the Grassland.

Species	Listing	Effects Determinations							
		Alternative A		Alternative B		Alternative C		Alternative D	
		10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Bald Eagle *Haliaeetus leucocephalus*	T	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA	NLAA
American Peregrine Falcon *Falco peregrinus*	S	NI	NI	NI	NI	NI	NI	NI	NI
Greater Sage Grouse *Centrocercus urophasianus*	S	NI	NI	NI	NI	NI	NI	NI	NI
Tricolored Blackbird *Agelaius tricolor*	S	NI	NI	NI	NI	NI	NI	NI	NI
Gray Flycatcher *Empidonax wrightii*	S	NI	MIIH	NI	MIIH	MIIH	BI	MIIH	BI
Pygmy Rabbit *Brachylagus idahoensis*	S	NI	MIIH	NI	MIIH	MIIH	BI	MIIH	BI
Bufflehead *Bucephala albeola*	S	NI	NI	NI	NI	NI	NI	NI	NI

3.8.4.2.1.1 Northern Bald Eagle (*Haliaeetus leucocephalus*)

These birds depend on available large pine trees for nest building. Reproductive habitat would not be affected by seeding treatments or grazing (see Table 3-59).

Reproductive habitat (all within the pine PAG) for bald eagles is currently within HRV. Alternatives A, B, C, and D would meet all the bald eagle Project Design Criteria (PDCs) in the Biological Assessment (Wildlife Report). By meeting the PDCs, this project would have an effect determination of "**May Affect, but not Likely Adversely Affect**" bald eagles as a result of its implementation.

Reproductive habitat for the bald eagle would increase under Alternatives A and B in both the short and long term. Habitat increases are associated with the increasing size of trees that this species depends on.

In Alternatives C and D, reproductive habitat would increase from existing, but would be slightly lower than Alternatives A and B in the short term due to thinning. Some habitat acres would be

"set back" to an earlier seral/structural stage but would increase again in the long term as the stands re-grow. Noticeable improvements in habitat from thinning juniper from pine stands would likely take longer than 30 years. Thinning the juniper would release more nutrients for the remaining pine trees to take advantage of. Proposed treatments would benefit this species in the long term with decreased risk of wildfire loss of limited reproductive habitat.

Under Alternatives C and D, seventeen miles of new fence could have a slight negative effect on bald eagles. These large birds can easily become entangled in fences, usually leading to death. There are no nest sites in the immediate area of the proposed fencing so effects would be minimal.

Ranking

Alternatives A and B are best for bald eagle reproductive habitat, followed by Alternatives C and D. Reason: This is because of the number of larger trees remaining. Bald eagle reproductive habitat is not affected by grazing.

Bald eagles use the uplands on the Grassland for foraging – mainly on Belding's ground squirrels. Refer to that discussion (FEIS, Chapter 3, Section 3.7.2.3.1.1) for effects to foraging habitat from all alternatives.

Table 3-59 (below) shows the predicted change in habitat for PETS species as a result of implementation of the various alternatives. These acres were modeled using WILDHAB. Habitat for the peregrine falcon, tricolored blackbird, and bufflehead cannot be modeled by WILDHAB because habitat is provided by features other than coniferous tree habitats or their seral/structural stages.

Table 3-59 Historic Range of Variability, Existing Habitat, and Projected Habitat Acres by Alternative for Threatened, Endangered, and Sensitive Species, Crooked River National Grassland.

PETS Species	HRV		Existing Acres	Post Treatment Acres of Habitat – below, above, within - HRV							
				Alt. A		Alt. B		Alt. C		Alt. D	
	Low	High		10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs	10 yrs	30 yrs
Bald Eagle	690	1915	773	955	1259	955	1259	829	1250	920	1250
Greater Sage Grouse	54529	87246	33878	22819	11760	22819	11760	31009	28830	27983	23255
Gray Flycatcher	66555	124417	48183	40712	26072	40712	26072	36808	41463	37430	35613
Pygmy Rabbit	38170	64344	29866	18807	11760	18807	11760	17546	26685	16883	21110

3.8.4.2.1.2 American Peregrine Falcon (*Falco peregrinus*)

There would be "**No Impact**" on peregrine falcons from any alternative.
There are no peregrines on the Grassland and none of the vegetation management proposals are near potential nest sites.

3.8.4.2.1.3 Greater (formerly Western) Sage Grouse (*Centrocercus urophasianus*)

There are no greater sage grouse present on the Grassland so there would be "**No Impact**" to this species from the projects proposed in any of the alternatives in this FEIS.

Although there are no sage grouse on the Grassland presently, there is potential habitat, comprised of three main habitat types: early seral grasses (E1g), early seral shrubs (E1s), and mid seral juniper

seedling and sapling (M2). The M2 category is included because, on the Grassland, these stands still function as grass and shrub habitats but contain juniper up to 4.9 inches dbh.

3.8.4.2.1.3.1 Alternative A

This alternative proposes no vegetation or grazing management. In the short term, without juniper treatments, the grass and shrub stands would still be present, but existing juniper trees would continue to; get larger and expand in range. In 30 years, most grass stands would be converted to shrublands and existing shrub stands would start converting to juniper woodlands. Under Alternative A, previously farmed and seeded lands would not become suitable habitat (as defined by this document) in the short or long term. It is expected that it would take longer than 30 years for those sites to convert back to native grass and shrub communities without seeding treatments. However, in that time period, habitat for early seral species would continue to decline as more sites would be converted to juniper woodlands. Long term, without natural disturbances (i.e. burning or grazing), habitat for these species would decrease to 11,760 acres from 33,878 acres (42,769 acres below HRV).

In Alternative A, 111,571 acres (the entire Grassland) would be closed to grazing. Table 3-32 displays cattle grazing by alternative. The lack of grazing would, in the short term, not increase habitat acreage, but would increase habitat quality. Grass plants would be allowed to grow at an unimpeded rate and native species would possibly return to some areas sooner. There would be an increase in hiding and nesting cover and no nest losses from trampling from domestic livestock. "Studies on sage grouse nesting habitat have documented that sage grouse tend to select nest sites under sagebrush plants that have large canopies. The canopies provide overhead cover and often correlate with an herbaceous (primarily grasses) understory, which provides lateral cover and assists birds in hiding from predators." (USDA, USDI, 2003). Long term, without grazing and without natural disturbances, open, bare areas would start filling in with grasses, decreasing important lek habitat and leading to a more continuous fuel layer which would possibly generate larger wildfires.

Alternative A would improve habitat quality for the sage grouse over time but, due to juniper expanding its range, would result in a large loss of habitat acreage in the long term.

3.8.4.2.1.3.2 Alternative B

Alternative B proposes no juniper or seeding treatments. The effects of no vegetation management (other than livestock grazing) would be the same as described under Alternative A.

Alternative B authorizes grazing on 102,938 acres of the Grassland. Of those acres, 95,384 acres would be grazed under a deferred rotation system and 7,554 acres under a short-duration system. Under a deferred rotation grazing system, each pasture within a grazing allotment is grazed one time per season. Each year, livestock start in a different pasture and the sequence of use is changed or “advanced” by one pasture. Under short-duration, the pastures are grazed for shorter time periods with the possibility of pasture re-entry and re-grazing later in the year.

Under a deferred rotation system neither habitat quantity nor quality is expected to increase in the short term. There would be sufficient lek sites; however, important hiding and nesting cover would not be expected to increase. Losses from nest/den trampling by domestic livestock could still occur as cattle will graze all areas of active allotments on the Grassland. There would be 8,633 acres of Grassland administered land left ungrazed per year (outside of allotments), where cover would be available, and there would be no nest trampling by domestic livestock. Long term, it is expected that native plant species could recolonize historically seeded areas, but the time frame would be considerably longer than 30 years (assuming natural disturbances to limit juniper expansion) (Simpson, 2004). In general, these grazed areas do not have continuous grasses as compared to ungrazed areas. Therefore the spread of large wildfires could be limited.

On the 7,554 acres under a short-duration system, hiding and nesting cover would be expected to be reduced short term, with repeated grazing in the same year. Long-term, native plant species would not be expected to recolonize past seedings. Higher intensity grazing would tend to sustain crested wheatgrass stands (Simpson 2004).

Due to the deferred rotation and short duration grazing systems proposed under Alternative B, the quality of nesting and hiding cover for the greater sage grouse would be expected to remain static under this alternative. A lack of vegetation management would allow juniper to expand its range, resulting in a large loss of habitat acreage in the long term.

3.8.4.2.1.3.3 Alternative C

Alternative C proposes approximately 49,000 acres of juniper treatments across the Grassland. Table 3-33 displays acres by treatment and by alternative. There are three objectives of the proposed juniper treatments:

- Move toward HRV for species density, distribution, and composition.
- Maintain the grass or shrub stands.
- Promote larger juniper tree growth with decreased density (in some areas).

As mentioned before, the greater sage grouse needs early seral grasses (E1g), early seral shrubs (E1s), and mid seral juniper seedling and sapling (M2) seral/structural cover types. In general, this alternative decreases the amount of juniper sized 1.0 inch diameter at breast height (dbh) up to 8.9 inches dbh and increases grass and shrub stands in the short term. Most of the treatments are intended to revert communities to an earlier successional stage/state and decrease western juniper's density and range on the Grassland. Grass stands will convert to shrub stands and existing juniper trees will get larger and increase their range again over the long term. As a result there is a decrease in habitat from 10 years to 30 years for the greater sage grouse.

Alternative C also proposes to till, seed, and fertilize approximately 8,300 acres. These treatments would convert treated acres from unsuitable to suitable wildlife habitat over the short term. The seeding projects will decrease shrub cover (primarily rabbitbrush) and increase the cover of grasses in the short term. However, any patches of existing sagebrush will be retained to provide a future seed source. The quality and quantity of habitat would increase for the sage grouse that relies on stands of native grasses and forbs and intermingled sagebrush. Long term, without further treatments these acres will convert to sagebrush stands with a western juniper overstory.

Even with the aggressive juniper and seeding treatments proposed under Alternative C, habitat would decrease short and long term for this greater sage grouse, but would be higher than the long term estimates under Alternatives A and B.

Alternative C also authorizes grazing on 82,923 acres (refer to Table 3-32 for Authorized Cattle Grazing Management by Alternative). Of that area, 7,614 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system, and 70,474 acres under a rest rotation system. The effects would be the same as those described under Alternative B for the acreage grazed under the deferred and short duration grazing systems. There are three major grazing management related differences in Alternative C as compared to Alternative B that affect wildlife habitat. Alternative C:

- Closes four allotments (8,233 acres).
- Changes two allotments to forage reserves (11,782 acres).
- Changes 85 percent of the grazed acreage to a rest rotation system.

Rest rotation grazing is similar to deferred rotation except one pasture is left ungrazed each year. Under this alternative, there would be approximately 36,981 acres left ungrazed each year. Hiding and nesting cover would be expected to increase due to the increased number of ungrazed acres.

Losses from nest trampling by domestic livestock could still occur, but would be less than under Alternative B. In general, there would be more diversity of grass and shrub heights under Alternative C. It is expected that native plant species could recolonize past seedings long term. Although the time frame for site conversion (to native plant communities) would be considerably longer than 30 years (assuming natural disturbances to limit juniper expansion), it would be expected to be approximately 20 percent faster than under a deferred rotation system (Simpson 2004). The increased risk of large wildfires would be less than Alternatives A and B.

Although grazing is proposed under this alternative, the addition of rest pastures would create a mosaic of habitats for the sage grouse (from lek habitat to hiding and nesting cover) across the Grassland.

None of the proposed fencing under this alternative is within potential sage grouse habitat. There would be no effects to this species' habitat.

Of the alternatives analyzed, Alternative C creates the most habitat and the highest level of habitat diversity for this species. There would be increased forb, grass, and shrub cover for hiding and nesting as well as maintenance of strutting grounds.

3.8.4.2.1.3.4 Alternative D

Alternative D proposes approximately 21,000 acres of juniper treatments across the Grassland. Table 3-33, displays acres by treatment by alternative. The objectives of the proposed juniper treatments are the same as those described in Alternative C. The effects to sage grouse habitat are also similar to those described under Alternative C. In this alternative, fewer acres would be converted to the early seral/structural grass and shrub stages. In the long term, this alternative does not create as much suitable habitat for the greater sage grouse as Alternative C, but more than Alternatives A and B. Habitat acreage for this species would increase to 27,983 acres in the short term, less than C, but 23,255 acres more than Alternatives A and B.

In Alternative D, the seeding proposals and effects to this species are identical to those described under Alternative C.

Alternative D also authorizes grazing on 88,085 acres (Table 3-32). Of those acres, 6,093 acres would be grazed under a deferred rotation system, 4,835 acres under a short-duration system, and 77,157 under a rest rotation grazing system. For the acreage grazed under the deferred and short duration grazing systems, the effects would be the same as under Alternative B. There are two major grazing management related differences between Alternative C and Alternative D that affect wildlife habitat. Alternative D:

- Closes five allotments and decreasing the size of one (13,261 acres).
- Changes 88 percent of the grazed acres to a rest rotation system.

Effects of Alternative D are very similar to Alternative C. Under this alternative, there would be 31,819 acres left ungrazed each year. Hiding and nesting cover would be expected to increase even more, due to the increased number of ungrazed acres. Losses from nest trampling by domestic livestock could still occur but would be less than in Alternatives B or C. Long term, through this alternative, native plant species would be expected to increase at the same rate as in Alternative C. The increased risk of large wildfires would be less than described under Alternative A, but higher than Alternatives B and C.

Although grazing is proposed under this alternative, the addition of rest pastures would create a mosaic of habitats for the sage grouse (from lek habitat to hiding and nesting cover) across the Grassland.

None of the proposed fencing under this alternative is within potential sage grouse habitat. There would be no effects to this species' habitat.

3.8.4.2.1.3.5 Ranking

Alternative C would be the best for potential greater sage grouse habitat, followed by D, A, then B. This is because of a long term increase in habitat quantity from juniper and seeding treatments, as well as the increased quality of habitat associated with decreased grazing and more conservative grazing practices.

3.8.4.2.1.4 Tricolored Blackbird (*Agelaius tricolor*)

There would be "**No Impact"** to this species or its habitat under any alternative. Habitat for this species is located within riparian areas. Alternative A would eliminate grazing and livestock would no longer utilize the few riparian areas accessible to them. Alternatives B, C, and D would continue grazing. Access to riparian areas would be limited to existing water gaps and occasional, short-term grazing within riparian pastures.

3.8.4.2.1.5 Gray Flycatcher (*Empidonax wrightii*)

The gray flycatcher utilizes the same habitat as the mountain quail. Effects of the juniper thinning and seeding alternatives on these species are identical (Table 3-59). Refer to the section on mountain quail (FEIS, Chapter 3, Section 3.7.2.3.1.3).

Effects of cattle grazing on the gray flycatcher are different from those on the mountain quail. The flycatcher does not nest on the ground, therefore, hiding and nesting cover is not as important as it is to other birds. Grazing has a minimal effect to these birds.

Under Alternatives C and D, seventeen miles of new fence would have a slight negative effect on the gray flycatcher. While it is not as common as for the larger birds such as raptors, smaller birds can become entangled in fences, risking injury or death.

There is "**No Impact**" expected to gray flycatchers from Alternatives A and B in the short term. Alternatives C and D "**May Impact Individuals or Habitat**", but will not likely contribute to a trend towards federal listing or loss of viability to the population or species within the next ten year period.

Long term, Alternatives A and B May Impact Individuals or Habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species and there is a Beneficial Impact expected from Alternatives C and D.

Ranking

Alternative C would be the best for the gray flycatcher, followed by Alternatives D, A, and B. This is because of a long term increase in habitat quantity from juniper and seeding treatments. Grazing has a minimal effect to these birds.

3.8.4.2.1.6 Pygmy Rabbit (Brachylagus idahoensis)

Effects of the juniper and seeding treatments in all alternatives to pygmy rabbit habitat (Table 3-59) are similar to the effects on the greater sage grouse (see discussion above). All references to lek/strutting habitat, however, do not apply to this mammal.

Grazing effects to this rabbit are also similar to the sage grouse (see discussion above). As with sage grouse, pygmy rabbits are reliant on a diversity of native habitats. Not only do they need sagebrush to survive the winters, but they also need healthy grass stands, and a diversity of forbs in the spring.

In the short and long term, changes in grazing management under Alternatives C and D would allow native grass and forb re-colonization a little faster than under Alternative B, but not as fast as under Alternative A (except in seeded areas). This would result in improved habitat quality but would not change the quantity of habitat available under either alternative and would therefore not affect habitat acres relative to HRV.

None of the proposed fencing under Alternatives C and D is within pygmy rabbit habitat. There would be no effects to this species.

After reviewing the effects, from Alternatives A and B, there would be "**No Impact**" to pygmy rabbit habitat short term. In the long term, these alternatives May Impact Individuals or Habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species.

Short term, Alternatives C and D "**May Impact Individuals or Habitat**", but will not likely contribute to a trend towards federal listing or loss of viability to the population or species. In the long term, these alternatives would be expected to have a Beneficial Impact on pygmy rabbit habitat.

Ranking

Alternative C would be the best for pygmy rabbit habitat, followed by D, A, then B. This is because of a long term increase in habitat quantity from juniper and seeding treatments, as well as the increased quality of habitat associated with decreased grazing and more conservative grazing practices.

3.8.4.2.1.7 Bufflehead (Bucephala albeola)

Bufflehead habitat cannot be modeled by WILDHAB. The Grassland is a migratory stop and the only habitat is located on or adjacent to the reservoirs that are used by these species during migration. There are no juniper treatments or seeding activities planned within these areas under any alternative.

Grazing management does not affect these birds on the Grassland.

There would be "**No Impact**" on either buffleheads or their habitat under any alternative.

3.8.4.2.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

3.8.4.2.2.1 Northern Bald Eagle (Haliaeetus leucocephalus)

Effects to control juniper densities and distribution (including the Grizzly Landscape Project and natural fuels projects) would likely continue as in the past if either Alternatives A or B were selected. Treatment methods would be variable and could be chainsaw thinning, prescribed fire, chainsaw and pile burning, etc. From 0 acres to approximately 3,000 acres per year would be treated. The actual number of acres treated each year would be highly variable due to budget and other constraints.

The bald eagle would benefit from these treatments. Juniper treatments that limit the juniper's range would change the vegetation back towards its historic composition. Reproductive habitat is within HRV and would still remain so even with these treatments.

Projects to control juniper density or distribution in addition to those treatments proposed under Alternatives C and D would not be expected to treat any additional acres as both alternatives

identify and treat existing priority areas. There would be no additional effects associated with juniper treatment to analyze under either alternative.

Wildfires have historically burned approximately 2,500 acres per year. Under Alternatives A and B, these numbers would be expected to be similar and possibly increase due to the increasing buildup of fuels and continued fuel continuities. This would be expected to result in increasingly intense and severe fires and the potential of burning increasingly larger acreages.

If wildfires were to occur in the ponderosa pine PAG, bald eagle habitat acreage would move from within, to below HRV. The pine PAG on the Grassland is comprised of only 1,700 acres. One wildfire could remove the large tree habitat within this PAG completely.

Alternatives C and D would be expected to reduce the size, intensity, and severity of wildfires by reducing fuel loadings and breaking fuel continuities. The risk of habitat loss in the pine PAG would be greatly decreased.

There are currently approximately 3,000 acres dominated by invasive plants, including noxious weeds. Sites dominated by these species do not provide quality habitat for wildlife. Efforts to control/eradicate existing populations and prevent the introduction of new populations would continue under all alternatives. There are no cumulative effects expected to bald eagles or their habitat from noxious weed control.

Continued development on adjacent private lands would continue to reduce the amount and distribution of habitat outside the boundaries of Grassland administered lands. Private land development, specifically residential and commercial development associated with subdivisions, towns and cities, would be expected to eliminate habitat in those areas for all habitat specialists regardless of the alternative. Remaining habitat, primarily associated with public lands, would be expected to become more important to bald eagles. HRV acreage was only calculated for National Forest System lands within the Grassland. Therefore private land development will not impact Grassland habitat or HRV acreage calculations under any of the alternatives.

There are no other past, present, or reasonably foreseeable actions that would have an affect on habitat and HRV under any of the alternatives.

3.8.4.2.2.2 American Peregrine Falcon (*Falco peregrinus*)

None of these birds are present on the Grassland. There would be no cumulative effects to these birds associated with any of the alternatives.

3.8.4.2.2.3 Greater (formerly Western) Sage Grouse (*Centrocercus urophasianus*)

Effects of projects designed to control juniper densities and distribution (this would include the Grizzly Landscape Project as well as natural fuels projects) would likely continue as in the past if either Alternative A or B were selected. Treatment methods would be variable and could include chainsaw thinning, prescribed fire, chainsaw and pile burning, etc. The actual acreage treated each year would be highly variable (0 to 3,000 acres) due to budgetary and other constraints.

The greater sage grouse would benefit from these treatments. Juniper treatments that limit the juniper's range would change the seral/structural mix and juxtaposition of vegetation towards HRV and subsequently, move habitat acreage for this species towards HRV. Greater sage grouse habitat is below HRV and would still remain so under all alternatives.

Projects to control juniper density or distribution in addition to those treatments proposed under Alternatives C and D would not be expected as both alternatives identify and treat existing priority

areas. There would be no additional effects associated with juniper treatment to analyze under either alternative.

Wildfires have historically burned approximately 2,500 acres per year. Under Alternatives A and B, these numbers would be expected to be similar and possibly increase due to the increasing buildup of fuels and continued fuel continuities. This would be expected to result in increasingly intense and severe fires, potentially burning increasingly larger acreages.

In the juniper PAG, wildfires could remove habitat for the greater sage grouse. This species utilizes shrub and young juniper stands as well as grass habitat. Large wildfires could remove an important part of their habitat thus rendering it unsuitable.

Alternatives C and D would be expected to reduce the size, intensity, and severity of wildfires by reducing fuel loadings and breaking fuel continuities. Smaller and less intense wildfires could benefit the greater sage grouse by providing early seral, open strutting grounds.

There are currently 3,000 acres dominated by invasive plants, including noxious weeds. Sites dominated by these species do not provide habitat for wildlife. Efforts to control/ eradicate existing populations and prevent the introduction of new populations would continue under all alternatives. Control efforts would not be expected to result in a measurable change in habitat acres for any habitat specialist species under any alternative in either the short or long term. The number of acres currently infested by invasive plant species is less than one percent of the current habitat acres for this species.

Continued development on adjacent private lands would further reduce the amount and distribution of wildlife habitat outside the boundaries of Grassland administered lands. Private land development, specifically residential and commercial development associated with subdivisions, towns and cities, would be expected to eliminate habitat in those areas for all habitat specialists regardless of the alternative. Remaining habitat, primarily associated with public lands, would be expected to become more important to the residual populations of these species. HRV acreage was only calculated for National Forest System lands within the Grassland. Therefore private land development will not impact Grassland habitat or HRV acreage calculations under any of the alternatives.

3.8.4.2.2.4 Tricolored Blackbird (*Agelaius tricolor*)

There are no proposed activities in any of the above-mentioned riparian areas. There would be no anticipated cumulative effects to these birds.

3.8.4.2.2.5 Gray Flycatcher (*Empidonax wrightii*)

Cumulative effects to the gray flycatcher would be similar to effects described for the greater sage grouse. Gray flycatchers do not use strutting grounds, however, small wildfires would create openings, which are preferred foraging areas for these birds.

3.8.4.2.2.6 Pygmy Rabbit (Brachylagus idahoensis)

Cumulative effects to the pygmy rabbit would be identical to effects described for the greater sage grouse (refer to discussion above).

As pygmy rabbits do not use strutting grounds, small wildfires would create areas of forbs and grasses, which are preferred for foraging by these rabbits in the spring.

3.8.4.2.2.7 Bufflehead (Bucephala albeola)

An expected increase in recreation may have a slight effect on these birds; however, most of the increased use would be during the summer, after these birds have left the Grassland.

3.8.5 Forest Plan Consistency

By utilizing project design criteria from this FEIS (Chapter 2, Sections 2.4, 2.5) and from the Biological Assessment all alternatives would be consistent with the LRMP standards and guidelines for PETS species.

3.9 Forage Production / Livestock Use

3.9.1 Current Management Direction (LRMP, FSM, etc.)

3.9.1.1 Management Area Standards and Guidelines

- MA-G1 Antelope Winter Range - Reserve fall green-up for antelope
- MA-G2 Metolius Deer Winter Range - Maintain early season livestock grazing
- MA-G3 General Forage - Graze suitable lands
- MA-G8 Squaw Creek - No livestock grazing on L. Squaw Creek. Utilize grazing system that protects & complements deer winter range & riparian areas
- MA-G9 Riparian - Where grazed follow stubble height standards in Programmatic BA
- M. Deschutes - L. Crooked Wild and Scenic River Mgmt Plan 1992 - No grazing within canyon walls. On plateaus graze in such manner for upward ecological trend

3.9.2 Affected Environment

3.9.2.1 History of Grazing Use on the Crooked River National Grassland

During the late 1800s and early 1900s there were large numbers of sheep, cattle, and horses grazing what is now the Crooked River National Grassland. Originally the Gray Butte Grazing Association (GBGA), which is the entity that acts as the grazing permittee on the Grassland, had close to 100 members. Over the years neighbors bought out neighbors and the number of Grazing Association members had decreased. Along the way, there have been examples where permitted numbers were not transferred and were lost. The result has been a reduction in permitted numbers of livestock on the Grassland as well as a reduction in the number of members of the Grazing Association. Today the Gray Butte Grazing Association is authorized to graze approximately 2,500 head of cattle and has 20 active members.

In the early days steers were weighed periodically during the season to document weight gains on improved pasture (crested wheatgrass seedings).

Prior to the late 1970s the GBGA allocated grazing use on an annual basis, and members may have grazed on the North Allotment one year and then on the Grizzly Allotment the next year. There was no consistency to where each member would graze from one year to the next.

Also during this time, the GBGA employed a range rider who was responsible for; maintaining range improvements, and coordination with Grassland personnel on pasture moves. Since the range rider was the on the ground contact, some of the GBGA members were not active in day to day allotment management.

In the late 1980s the GBGA, in an effort to cut costs, stopped hiring a range rider and transitioned to making each member responsible for their own respective allotments. This appeared to effectively build individual member "ownership" on range improvements and the day to day management of his/her allotment.

During this time period pastures were large, in many cases running cattle for 60 days or more. These long periods of use during the growing season appeared to result in to native ecological systems, by allowing livestock to be re-graze the same plant several times during its active growth phase. This resulted in plants with low vigor and poor biomass production.

In the mid-1980s the Grassland began cross fencing the larger pastures to make smaller pastures and thus reducing the amount of time livestock spent in each pasture, as well as setting up options

for rotational grazing. Over the past 20 years most of the allotments have gone from two to three pastures to six to ten pasture systems. These actions set the stage for implementation of higher intensity/shorter duration grazing, the goal being to reduce livestock impacts on forage plant species and related ecological systems. The advent of these deferred grazing systems provided an opportunity to re-graze pastures which had been grazed early in the growing season and had subsequently continued plant growth and completed plant reproductive cycles.

In 1986, the Juniper Butte Allotment was set up as a trial Holistic Resource Management, high-intensity short-duration grazing system. Additional pasture division fences were built and pastures were grazed for short time periods to try to eliminate grazing of new re-growth. Pastures were re-grazed after sufficient rest (30 days between exit/entry during fast growth, and 90 days between exit/entry during slow growth periods). Some years pastures were grazed as many as three times. Under this system impacts to plant vigor and species composition could occur if the second or third grazing period were initiated too soon (prior to allowing the plants to recover from the previous grazing treatments). Holistic Resource Management high intensity/short duration systems are management intensive requiring considerable expenditure of effort in monitoring and rapid management adjustment based upon the evaluation of monitoring results.

3.9.2.2 Forage Production by Allotment

Refer to Alternative B - Current Management located in Chapter 2, Table 2-1 which displays the size, the maximum, authorized AUMs (21,714) and the present grazing system employed by each allotment for a description of current grazing practices.

Table 3-60 displays forage production (in pounds) by allotment. There was no data available for three allotments: Cotter Pond Devine, and Kennedy. Annual production is a measure of biomass produced annually by all plants. Useable production is the portion of the annual production that is palatable and available to livestock. The NRCS survey recommended using 30 percent of the useable production for the livestock allocation (National Range and Pasture Handbook, 1997). This is a conservative approach to stocking livestock. This allocation equals approximately 20,000 animal unit months (AUMs), available for livestock on the Grassland. An AUM is equal to the forage required to feed a cow for one month, or 790 pounds of dry weight forage. The present upper limit for stocking on the Grassland is 21,714 AUMs. The 20-year average actual use is 14,333 AUMs. Annual/actual use in AUMs is a function of demand, meeting stubble height grazing standards and the annual growing conditions (amount of precipitation and temperature). The amount of vegetation remaining after grazing (balance of production) is equal to annual production less, the livestock allocation. This is the remaining vegetation production available for all other uses and needs.

Table 3-60 Forage Production (lbs) by Allotment (All ownerships), CRNG (NRCS 2001)

Allotment	Acres	Annual Production (Lbs)	Useable Production (Lbs)	Livestock Allocation (Lbs)	Balance of Production (Lbs)
Blanchard	7,762	6,454,047	5,197,506	1,559,252	4,894,795
Boyce	5,656	3,166,793	2,640,837	792,251	2,374,542
Canadian Bench	3,997	2,670,333	2,166,016	649,805	2,020,528
Clevenger	638	264,727	178,857	53,657	211,070
Cyrus	9,325	9,148,994	7,301,567	2,190,470	6,958,524
Dump	471	272,527	234,125	70,238	202,290
Fox	5,814	3,788,111	3,030,207	909,062	2,879,049
Goldmine/Falls	804	519,050	390,623	117,187	401,863
Gorge	1,182	572,185	393,546	118,064	454,121
Grizzly	9,179	6,987,576	4,619,471	1,385,841	5,601,735
Holmes-Squaw Creek	7,832	5,658,004	4,099,368	1,229,810	4,428,194
Juniper Butte	7,818	4,821,005	3,389,923	1,016,977	3,804,028
Lone Pine	9,222	7,393,815	5,717,181	1,715,154	5,678,661
Lower Desert	23,745	18,069,705	15,767,301	4,730,190	13,339,515
North	10,251	6,306,438	4,739,902	1,421,971	4,884,468
Round Butte	2,534	1,201,208	822,568	246,771	954,438
Peninsula	2,208	1,416,001	978,850	293,655	1,122,346
Rush	6,506	3,899,550	2,866,804	860,041	3,039,509
Steer	2,327	1,287,555	971,735	291,521	996,035
Weaning Pasture	238	343,032	236,692	71,008	272,025
Williams	1,277	900,623	696,839	209,052	691,572
Total	**119,763**	**85,141,279**	**66,439,918**	**19,931,977**	**65,209,308**

3.9.2.3 Capability, Sustainability, and Suitability

3.9.2.3.1 Capability

Forest Service Manual 1905 (10) indicates that capability refers to the potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at given levels of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, soils and geology, as well as the application of management practices, such as silviculture or protection from fire, insects and disease (36 CFR 219.3). Therefore, grazing capability is a reflection of the physical limitations (slope, accessibility, tree canopy cover, distance to water, site forage production) to grazing a given area. Grazing capability on the Grassland appears to be primarily limited by forage production and juniper canopy cover. The gentle slopes occurring on the Grassland generally are not limiting to livestock except within the two gorges (Deschutes and Crooked River) which have been designated as unsuitable for grazing in the LRMP for the Grassland (see suitability discussion Section 3.9.2.3.3). The NRCS 2001 Ecological Site Condition and Trend Survey (and the mapping of associated Eco-sites) provides an indication of capable range across the Grassland, as these inventories measured both forage production and juniper canopy cover.

Due to limited forage production 603 acres of the Grassland were determined to be, "not capable for grazing". Due to canopy covers of western juniper exceeding 55 percent (L4a Viable model designation) 483 acres were determined to be, "not capable for grazing". Two hundred thirty five of each of these acreage estimates overlapped and provided both limited forage production, and

canopy covers in excess of 55 percent. Therefore, a total of 851 acres of the Grassland (excepting the gorges) are considered to be, "not capable for grazing".

3.9.2.3.2 Sustainability

Determination of stocking levels for "grazing sustainability" are first dependent upon management strategy, and then are most appropriately determined by ability to meet LRMP standards and guidelines, with stocking adjusted based upon monitoring results. These adjustments have been made over time on the Grassland to determine "sustainable" grazing levels under current management strategies and plant association distributions and conditions.

3.9.2.3.3 Suitability

Forest Service Manual 1905 (91) indicates that suitability is a determination of, "[t]he appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternatives uses foregone…" This analysis was conducted during the development of the Land and Resource Management Plan for the Crooked River National Grassland, and made suitability and management direction determinations based upon Management Area designation (LRMP p. 4-21 through 4-128). Management areas within which livestock grazing was determined to be "unsuitable" are listed below:

- MA G4 (Research Natural Areas, 111 acres) - Two Research Natural Areas are located on the Grassland (LRMP p. 4-26). Permit no grazing of domestic livestock within the RNA unless needed to maintain a specific vegetative type (LRMP p. 4-76).
- MA G6 (Crooked River Recreation Area, 720 acres) - Allow no livestock grazing (LRMP p. 4-75-76).
- MA G7 (Deschutes River Scenic Corridor, 650 acres) - Allow no livestock grazing (LRMP p. 4-75-76).
- MA G8 (Squaw Creek, 7,840 acres) - Allow no livestock grazing within lower Squaw Creek canyon (the 1,370 acre segment proposed for Wild and Scenic River designation). Utilize grazing systems that protect and complement the deer winter range and riparian areas (LRMP p. 4-77).
- MA G11 (Haystack Reservoir, 150 acres) - Continue to keep campground closed to grazing (LRMP p. 4-76).
- MA G12 (Cove Palisades State Park, 2,690 acres) - Allow no livestock grazing (LRMP p. 4-75-76).

During the analysis for the FEIS, resource and socio-economic factors were evaluated relative to range suitability determinations. As part of this evaluation: Alternative A proposes to close 102,928 acres to domestic livestock grazing, Alternative C proposes to close 8,233 additional acres to domestic livestock grazing, while Alternative D proposes to close 13,261 additional acres to domestic livestock grazing. Selection of any of these alternatives would further limit existing suitability determinations.

3.9.2.4 Livestock Grazing Allotments and Authorized Use

3.9.2.4.1 Authorized Use

Refer to Tables 2-1, 2-2, and 2-3 located in Chapter 2 for authorized AUMs and other pertinent allotment stocking rate data.

3.9.2.4.1.1 Objectives

Each grazing allotment may have a variety of "objectives" associated with the management of the allotment. Objectives may include pasture by pasture cover type objectives such as moving a solid

stand of sagebrush toward a mosaic of sagebrush and grass cover types and thereby moving closer to HRV. Grazing objectives may include using salt and or riding to keep livestock dispersed and not concentrated in a specified area, or requiring that livestock to be out of a certain area by a certain time in order to provide forage for deer or antelope.

3.9.2.4.1.2 Standards

"Standards" are different from objectives in that they are prescribed in the LRMP or by a Level I Team (comprised of interagency fisheries specialists, wildlife specialists, ecologists and others) for implementation of the Endangered Species Act. A Biological Assessment (BA) has been written for all public land activities occurring within the Deschutes River Basin in relation to threatened, endangered, or sensitive animal or plant species located in the analysis area. The BA provides Monitoring Standards for many of the uses (such as grazing, timber sale activity, and road construction) that occur in the area. The BA describes stubble height standards for the various pastures on the Deschutes and Ochoco National Forests (see FEIS, Chapter 2, Section 2.4). These standards are designed to leave sufficient stubble height of grass at the end of the grazing season to protect sites from various forms of erosion, which in turn protects streams from sedimentation (outside normal sediment loads). On the Grassland, key areas and key plant species have been defined for every pasture, on which stubble heights are monitored annually. These monitoring areas not only provide year-end monitoring benchmarks but provide a management indication of when to move livestock during the grazing season. They are monitored by both the grazing permittee representatives and Grassland personnel.

3.9.2.4.1.3 Management Agreement between Gray Butte Grazing Association and the Grassland

The Grazing Agreement (Appendix E of the Range Specialist Report) is an agreement between the Forest Service and Gray Butte Grazing Association (GBGA), which is the grazing permit holder on the Grassland. The Association administers the individual grazing permits with the members of the Association. Grazing agreements are administered under the guidelines of Forest Service Manual (FSM) 2209.13 (USDA 2002). The association assumes some responsibilities that normally are held by the Forest Service such as billing, grazing permit record keeping, range improvement maintenance, compliance and monitoring. Grazing associations are required by federal policy on National Grasslands (at least the Bankhead-Jones Farm Tenant Act Title III lands portions thereof) but may also voluntarily exist on National Forests.

The purpose of the Agreement is to authorize grazing use by the GBGA on the Grassland in such a way as to provide for resource management, and accomplishment of the Grassland Land and Resource Management Plan (LRMP 1989) management goals and objectives through appropriate livestock use.

There are currently 23 grazing allotments on the Grassland. Most allotments have a four to seven month grazing season depending on growing conditions and livestock turnout head counts.

Most allotments have between five and ten pastures allowing for effective control of grazing. Most are grazed under deferred grazing management systems.

Over the past 15 years, modifications to the deferred grazing system have been attempted such as re-grazing pastures that were grazed early in order to capture plant re-growth. With this practice all pastures were grazed to minimum stubble heights standards, (leaving no re-growth). As a result of this practice, it also appeared to the Grassland staff that organic matter accumulation was limited, thus hindering establishment of native deep-rooted perennial grasses. Visual habitat diversity was also limited when all pastures were grazed to the same stubble height standard (Zalunardo pers. comm. 2003).

Permitted stocking rates are not guaranteed. Stubble height guidelines are established in the Joint Aquatic and Terrestrial Programmatic Biological Assessment for Lands within the Deschutes and Ochoco National Forests 2003-2006 (USDA/USDI 2003) which trigger pasture moves. The length of the grazing season is based on forage production and key area utilization and is not based on pre-determined calendar dates. The end result is that a minimum prescribed end-of-grazing-season stubble height is left on all pastures with season of use and livestock numbers varying from year to year in order to meet this requirement (see Chapter 2, Section 2.4).

3.9.2.4.1.4 Range Improvements

There are approximately 100 miles of buried water pipeline connecting 175 water troughs to 29 wells on the Grassland. There are approximately 30 developed springs. Developed springs generally consist of: an exclosure fence (to protect the spring source), a spring box, associated pipes, and water troughs (Map 4 - Water sources, Spring Developments, Guzzlers, Fences, and Exclosures). The Soil Conservation Service (SCS), Gray Butte Grazing Association and the Civilian Conservation Corps originally developed many of these structural improvements. Since the 1950s, additional range improvements have been developed and maintained by: the Gray Butte Grazing Association, the Oregon Hunter's Association of Redmond, and the Grassland.

There are approximately 850 miles of fence on the Grassland that control livestock distribution, grazing intensity, and preclude livestock trespass. These fences consist of approximately 550 miles of allotment boundary fence, 200 miles of internal fence, and 100 miles of riparian livestock exclosure fence. The type of fencing varies in condition and construction type. In general, all fences are and have been built to standards described in Forest Service Handbook (FSH) 2209.22 (USDA 1991).

A concerted attempt has been made to convert fences that pose hazards for wildlife to fences that allow for easy passage by antelope, deer, and other animals. This has been accomplished by; changing the bottom strand from barbed to smooth wire, changing the distance between strands, and lowering the overall height of the fence. There have also been several miles of old woven wire fence replaced with barbed/smooth wire fences, to improve wildlife passage.

General fence maintenance is the responsibility of the livestock grazing permittees. Exceptions include the exclosure fences that are maintained by a combination of grazing permittees, Grassland personnel, and Grassland partners.

The SCS began rehabilitation of approximately 60,000 acres of abandoned farmland in the 1930s. Nonstructural range improvements have been occurring since that time. These improvements included: brush beating, chemical herbicide spraying (prior to 1970), tilling and seeding of grasses and forbs, juniper cutting, and prescribed fire (used for the control of juniper and shrubs) (Map 5 - Historical Vegetation Project).

Additional information about historical structural and non-structural range improvements is available at the Grassland office in Madras, Oregon.

3.9.3 Environmental Effects

3.9.3.1 Direct and Indirect Effects

There would be a short-term increase in forage production under Alternative A due to the removal of livestock. There would be no short term change in forage production over current levels under Alternative B because livestock would not be removed and no changes in current grazing management would occur.

In the long term, there would be a decrease in forage production under both Alternatives A and B due to plant community conversion from sagebrush steppe to juniper woodland types. In general, juniper woodland plant associations will produce less forage than sagebrush steppe plant associations on the Grassland (Range Specialist Report). Additional forage reductions would be associated with potential conversion of crested wheatgrass sites to Sandberg's bluegrass dominated sites (Range Specialist Report)

Under Alternatives A and B, if given a very long time (50 years plus), Sandberg's bluegrass sites could respond one of two ways:

- These sites could advance toward potential plant communities. If so, deep-rooted native perennials would gradually replace Sandberg's bluegrass with an accompanying increase in forage production (Range Specialist Report)
- If these sites are located on a slope greater than 15 percent or where these sites have experienced too severe levels of soil erosion during the homesteading era, these sites would continue to deteriorate and move downward ecologically towards annual forb and grass dominance. If juniper expands its current range and dominates these sites this process would limit or potentially eliminate the upward trend noted above.

Un-grazed vegetation (forage) would remain palatable for approximately two to three years under Alternative A and then decline in palatability. Wildfire would restore palatability for a short period, perhaps several years, before it would again decline. Under Alternative B, palatability of existing vegetation would remain as it is due to continued grazing.

The addition of rest pastures to allotments under both Alternatives C and D would aid in the process of accumulating organic matter on the soil surface and aid in seed production from native plant species. This would enhance deep-rooted native perennial plant establishment. The end result would be the advancement of ecological condition toward sagebrush/bunchgrass plant associations and promote seral/structural stage drift toward historic distribution and composition. Having rest pastures would also increase the diversity of stubble height available at the end of the grazing season for wildlife (especially hiding and nesting cover for birds and small mammals). Adding a rest pasture would increase forage production as the vegetation within each pasture would be allowed complete its life cycle one year during each grazing rotation cycle. This would allow grazed plants time to build carbohydrate reserves within their root system, thus gaining vigor. This would also allow plants to produce and deposit litter (organic matter) on the soil surface that would aid in the establishment and maintenance of deep-rooted perennial grasses which are the best forage producers and soil stabilizers on the Grassland.

Juniper control and seeding activities proposed under Alternatives C and D would result in increased forage production and palatability. Proposed juniper density control would result in increased availability of moisture, nutrients, sunlight, and initially, growing space for grasses, forbs, and mid-sized shrubs. Alternative C proposes to treat approximately 49,000 acres of juniper of which 8,344 acres are proposed for re-seeding while Alternative D would control approximately 29,500 acres of juniper of which 8,344 acres will be re-seeded. In the short-term juniper slash would cover some forage. Within the two years following treatment this effect would be offset by the increase in production in the general area of each cut juniper.

On the sites where tilling, seeding, and fertilizing is proposed, forage production and palatability would improve because more sunlight, soil nutrients, and moisture would then be available to the seeded species. In the short-term, forage would be lost to the permittee as the pasture would be rested from grazing for a minimum of two years. Following rest, this action would provide a more stable forage base as forage plant diversity would be increased. By shifting the plant species composition from crested wheatgrass and Sandberg's bluegrass to a more diverse plant composition dominated by deep-rooted native and cultivar species; forage production, the length of the effective

growing season and overall vegetative diversity would increase. Both Alternatives C and D propose to seed the same number of acres.

Implementation of rest rotation or deferred rotation grazing systems on allotments currently not implementing those systems (Tables 2.2 and 2.3) would also help to improve forage production and palatability. Plants would be periodically allowed one complete growing season without grazing pressure from livestock. The following year the previously rested pasture would be grazed last in the rotation to allow plant growth through seed production prior to grazing. Timing of grazing during other grazing seasons would be varied, permitting plants to attain varying stages of development before and/or after grazing.

Under Alternative A all range improvements currently assigned to the Gray Butte Grazing Association would be abandoned as the grazing permit lapses. Other groups would most likely adopt maintenance responsibility for certain range improvements of benefit to the resources they are concerned about. These would generally be water developments. It is questionable whether smaller groups would have the resources necessary to maintain the extensive well and pipeline system. Under Alternative B all existing (assigned) range improvements would continue to be maintained by the Gray Butte Grazing Association. Under Alternatives C and D, 17 miles of new fence construction would be necessary to implement these alternatives.

Reduction in Livestock Grazing Use Due to Implementation of Rest Rotation Grazing Systems Under Alternatives C and D.

Alternative C

Alternative C proposes implementation of rest rotation grazing systems on ten allotments. Since the forage use standards remain the same (see Chapter 2, Section 2.4.1) the implementation of a rest rotation grazing systems would result in an effective reduction in grazing use as follows when compared to Alternative B:

Allotment	# of Pastures	% Reduction	Authorized AUMs	Reduced AUMs
Blanchard	7	14	2,113	296
Boyce	7	14	1,878	263
Cyrus	7	14	1,878	263
Fox/Dump	7	14	1,641	230
Grizzly	9	11	2,348	258
Lone Pine	9	11	1,878	207
Lower Desert	3	33	Vacant	*
North	9	11	2,802	308
Round Butte	7	14	423	59
Rush	8	12.5	1,614	202
			Total	**2,086**

* NOTE: Not calculated because, under Alternative B, the majority of Lower Desert Allotment is vacant.

The reduction in use would total 2,086 AUMs per year. This annual reduction in use would be for a relatively short duration (approximately ten years). After ten years forage plant species would be expected to substantially increase due to prescribed burning, seeding, and implementation of the rest rotation grazing system. This increase would provide a larger amount of forage production available for livestock consumption and in turn increased grazing use (to pre rest rotation implementation levels). The total reduction in grazing use would be 20,860 AUMs over the fist decade.

Pasture rest would be planned in conjunction with improvements like prescribed burning and seeding. In this way pastures where burning or seeding has occurred will be utilized as the rest pasture for the grazing system for two years following the improvement (see Chapter 2, Section 2.5.3). For example, if one pasture in the Grizzly Allotment is being rested for two years because of a recent seeding, the remaining eight pastures would be grazed. After the two years of rest on the seeded pasture, then the pasture rotation would be applied and a different pasture would then be rested.

Alternative D

Alternative D proposes implementation of rest rotation grazing on eleven allotments. Since the forage use standards remain the same (see Chapter 2, Section 2.4.1) the implementation of a rest rotation grazing systems would result in an effective reduction in grazing use as follows when compared to Alternative B:

Allotment	# of Pastures	% Reduction	Authorized AUMs	Reduced AUMs
Blanchard	7	14	2,113	296
Boyce	7	14	1,878	263
Cyrus	7	14	1,878	263
Fox/Dump	7	14	1,641	230
Grizzly	9	11	2,348	258
Juniper Butte	5	20	430	86
Lone Pine	9	11	1,878	207
Lower Desert	3	33	Vacant	*
North	9	11	2,802	308
Round Butte	7	14	423	59
Rush	8	12.5	1,614	202
			Total	**2,172**

* NOTE: Not calculated because, under Alternative B, the majority of Lower Desert Allotment is vacant.

The reduction in use due to the implementation of rest rotation grazing on eleven allotments would amount to a total of 2,172 AUMs per year. This reduction in use would be for a relatively short duration (approximately ten years). After ten years forage plant species would be expected to substantially increase due to prescribed burning, seeding, and implementation of the rest rotation grazing system. This increase would provide a larger amount of forage production available for livestock consumption and in turn increased grazing use (to pre rest rotation implementation levels). The total reduction in grazing use would be 21,720 AUMs for the fist decade.

Pasture rest would be planned in conjunction with improvements like prescribed burning and seeding. In this way pastures where burning or seeding has occurred will be utilized as the rest pasture for the grazing system for two years following the improvement (see Chapter 2, Section 2.5.3). For example, if one pasture in the Grizzly Allotment is being rested for two years because of a recent seeding, the remaining eight pastures would be grazed. After the two years of rest on the seeded pasture, then the pasture rotation would be applied and a different pasture would then be rested.

Table 3-61 Comparison of Grazing Use by Alternative

Alternative	Acres Open to Grazing	Acres Closed to Grazing	Acres within Forage Reserves	Acres Vacant Allots	AUM Reduction Short Term (10 years)	Annual Maximum Authorized AUMs
A – No Action (No Grazing)	0	102,938	0	0	217,140	0
B – Current Management	102,938	0	0	2,950	0	21,714
C – Proposed Action	82,923	8,233	11,782	0	20,860	20,289
D	88,085	13,261	0	1,592	21,720	20,983

Acres Open to Grazing = Acres within allotments open to grazing.
Acres Closed to Grazing = Acres in allotments that will be closed to grazing.
Acres within Forage Reserves = Acres within Forage Reserves established in Alt C.
Acres Vacant Allots = Acres within vacant allotments, these could be restocked in the future.
AUM Reduction Short Term (10 Years) = AUM Reduction due to implementation of rest rotation system and/or closing of active allotments in Alt A.
Annual Maximum Authorized AUMs = Maximum Authorized grazing use (AUMs) per year.

3.9.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

The cumulative effects discussed in the, "Western Juniper and Ecological Trends" sections (Chapter 3, Sections 3.2.3.3, 3.3.3.4) are reflected in forage production. In summary they are:

Pre-settlement forage conditions of the Grassland were excellent as there was a dynamic mosaic of bunchgrass, shrub/bunchgrass and juniper/bunchgrass dominated plant communities with all of the soil horizons in place. This condition was maintained by periodic fire.

During the homesteading era, soil and natural resources were used intensively and were depleted by farming. It is estimated that forage conditions were at an all-time low at the end of this era as approximately 60,000 acres of farm ground was abandoned leaving early seral annual plants that provided little to no forage, vegetative diversity, or soil protection. The native plant communities had been grazed hard for years and needed restoration. It is assumed that they too were lacking some; species, plant vigor and were not producing at their potential. The homesteaders cut most of what juniper that did exist on the Grassland for farm and personal use. Farm ground is still recovering and juniper is advancing, resulting in forage plant production remaining below its ecological potential. Livestock grazing has shown to be compatible on most Grassland sites as demonstrated by upward and stable trends over the past 50 years (Range Specialist Report). Forage production as a whole on the Grassland will always be in a state of flux, as the effects of wildfire, prescribed fire, juniper cutting, seeding and grazing management will affect the standing biomass on the Grassland. Most important and significant to forage production are annual and season climatic changes experienced in Central Oregon. While the annual precipitation averages between 8 and 12 inches on the Grassland, annual fluctuations are greater, (somewhere between 3 and 20 inches). When it rains, forage production can double what it is during drought years. Actual use grazing records demonstrate this fluctuation over the years. Forage harvested (in animal unit months - AUMs) on the Grassland ranges between 6,000 and 21,000 AUMs annually. This fluctuation in grazing use is primarily a function of annual climatic conditions.

Other foreseeable actions will have an effect on forage production and, therefore livestock stocking rates on the Grassland. The Grizzly Landscape Vegetation Project, which is reducing juniper

density, will in effect increase forage production short to mid term. Wildfire, which could kill juniper and move the amount of E1g (grassland) seral/structural condition closer to its HRV could increase forage production or, if the fire were very hot, it could reduce forage production as annual grasses are established. Utility corridor vegetation maintenance activities that remove juniper, and future fuel management projects which reduce shrub canopies and/or kill juniper could also increase forage production. Fuelwood cutting which removes juniper and Central Oregon Wildfire School practice fires which kill juniper all have the potential to increase forage production on the Grassland by removing competing vegetation and making it available for grass production. These effects will probably last for approximately 2 to 30 years following each vegetative treatment depending on the site and the activity.

Other foreseeable actions such as; off-road vehicle use, camping, mineral source expansion and fire suppression, have the potential to reduce forage production as they remove vegetation creating areas of bare soil.

Adjacent landowner activities will have little to no effect on forage production on the Grassland.

A product of allowing grazing on public land is the maintenance of "open space" created by the Grassland being adjacent to ranch and farmland. Together, the two ownerships create open space. The grazing permit held by any given rancher contributes to the stability of their condition (open space). Open space with the diversity of open rangeland, farmed fields of alfalfa and other private lands, provide valuable habitat for a variety of birds and wildlife.

3.9.4 Forest Plan Consistency

Standards and Guidelines provide management direction. They are developed for specific management areas that are described in the (LRMP). Refer to Map 16 - LRMP Management Area and Map 6 - Special Management Areas for locations. This plan provides direction for ten-year periods.

Table 3-62 displays pertinent management area standards and guidelines along with a consistency statement for each alternative. Consistency outcomes are similar because range/livestock management on the Grassland is and has always been adaptive. That is, when a practice is applied, it is monitored. If the practice is not producing positive and consistent results as measured by Standards and Guidelines it is dropped or changed. An example is the re-grazing of pastures practiced in the 1980s and 1990s. The idea was to capture or harvest the re-growth that is produced in the early summer after a pasture has been grazed. Based upon the observations of Grassland staff professionals, this practice generally failed as it retarded succession and eliminated structural diversity. The practice was eliminated on all but one allotment where it has proven to be successful. In a similar manner, livestock grazing was eliminated on the Squaw Creek pasture.

Table 3-62 Management Area Standards, Guidelines, and Consistencies by Alternative for Grazing

Management Area	MA-G1 Antelope Winter Range	MA-G2 Metolius Deer Winter Range	MA-G3 General Forage	MA-G8 Squaw Creek	MA-G9 Riparian	M. Deschutes - L. Crooked Wild and Scenic River Mgmt Plan 1992
Size - acres	22,700	12,740	59,440	7,840	N/A	650
Affected Allotments	Blanchard, Grizzly, Steer, Boyce, Rush	Lower Desert, Holmes-Squaw Creek	14 Grazing Allotments	Squaw Creek Pasture	Over 90 % of the riparian areas are fenced from livestock grazing	Peninsula, Clevenger, Goldmine/Falls
Standard & Guideline	Reserve fall greenup for antelope	Maintain early season livestock grazing	Graze suitable lands	No livestock grazing on L. Squaw Creek. Utilize grazing system that protects & complements deer winter range & riparian areas	Where grazed follow stubble height standards in Programmatic BA	No grazing within canyon walls. On plateaus graze in such manner for upward ecological trend
Alternative A Consistency	Yes	Yes	Yes	Yes	Yes	Yes
Alternative B Consistency	Yes	Yes	Yes	Yes	Yes	Yes
Alternative C Consistency	Yes	Yes	Yes	Yes	Yes	Yes
Alternative D Consistency	Yes	Yes	Yes	Yes	Yes	Yes

3.11 Plants of Cultural Value

3.11.1 Current Management Direction (LRMP, FSM, etc.)

3.11.1.1 Biological Diversity (USDA 1991, 4-3, 4)

3.11.1.1.1 Goal(s)

- Maintain native, historic, and desirable introduced plant and animal species and communities, including those that may be threatened, endangered, or sensitive.
- Maintain or enhance ecosystem functions to provide for long-term productivity of resources and biological communities.

3.11.1.1.2 Desired Future Condition

In Ten Years

- All plant communities will be present as no planned activities are intensive to the point that they would result in a change from one plant community to another. Vegetative conditions will be improving on areas that are presently in less than good condition.

Fifty Years and Beyond

- All areas will be in good vegetative condition.

3.11.1.1.3 Standards and Guidelines

- Protect fragile sites such as shallow soil areas (scablands) and natural meadows.
- Monitor plant communities/associations to determine conditions and trends. Encourage recovery or prevent deterioration where activities may be leading to poor conditions; downward trends; the displacement of native plants or plant communities by unusually weedy, annual, or noxious vegetations; or where cover is atypically low for the particular plant associations (see Hall 1973, Hopkins and Kovalchik 1983). Manage aspen stands to produce vigorous population.

3.11.1.2 Cultural Resources - (USDA 1991, 4-4)

3.11.1.2.1 Desired Future Condition

Fifty Years and Beyond

- …Native Americans will make greater use of the Grassland for traditional food gathering and religious practices.

3.11.1.3 Prescribed Fire - (USDA 1991, 4-68)

- Slash will not be piled on scablands unless there is no other feasible location, i.e. under circumstances dictated by topography.

3.11.2 Affected Environment

Many plant species of cultural value occur within the analysis area. Though several lists have been developed, it is apparent that there was once much wider recognition and use of native plants than there are today.

Riparian species, including willow (*Salix* L.), rushes (*Scirpus* L.), and dogwood (*Cornus stolonifera* Michx.) provided materials commonly used to construct baskets. Other plants from a variety of habitat were used as medicines, tobacco, dyes, and teas. Native Americans relied heavily on edible roots such as bitterroot *(Lewisia rediviva* Pursh*)*, common camas (*Camassia quamash* (Pursh) Greene), yampa *(Perideridia gairdneri* (H. & A.) Math.*)*, biscuitroot *(Lomatium cous* (Wats.) Coult. and Rose)*,* and other *Lomatium* species. Continuing the tradition of root gathering is important to local tribes.

The primary use/interest today appears to be those plants used as food. The most commonly used cultural plants, *Lomatium* species and bitterroot, are associated primarily with scablands (lithosols). Compared with other areas of public land in central Oregon, the analysis area is typical for densities of these plants. Approximately two percent of the analysis area is scabland habitat.

Scabland soils are shallow and rocky and often have high clay content. Because these soils become saturated and experience frost heaving during winter, native vegetation on these habitats does not appear to completely recover from heavy disturbance such as road construction. The LRMP emphasizes protection of these fragile areas (LRMP 1989, page 4-61).

Lomatium species also probably existed on the sites that were tilled during the homesteading era and then tilled and seeded during the Soil Conservation Service era. Some areas were also sprayed with herbicides, which also reduced native plants, especially dicot species such as *Lomatium. Lomatium* is slowly returning to some of these sites. Return of these and other native species, especially annual and other early-succession species, has been noted on certain sites. However late-succession plants such as native bunchgrasses are generally absent on a majority of the old farm sites.

Cultural-use plants are still relatively common in non-tilled areas, including scablands. Portions of the scabland habitat presently include non-native invasive plants such as medusahead. Though most habitats appear to be maintaining viable communities of native plants, densities and extent of invasive plants could increase and, therefore, reduce suitable habitat for plants of cultural value.

No cultural plant monitoring data is available at this time. Range monitoring data indicates most habitats on public lands appear stable. Exceptions occur where noxious weed infestations have expanded, primarily along heavily disturbed areas such as old town sites, roadsides, and utility corridors. Private lands are at a higher risk of change primarily due to potential for development.

The Geneva II wildfire burned relatively few areas of habitat occupied by species that appear to be commonly used by the local Tribes. However one species of lichen, *Bryoria fremontii* (Tuck.) Brodo and Hawks) also known as “koonts” or “black moss” grows primarily on the lower branches of conifers. The Grassland has relatively few sites where this species occurs (primarily on the far western side of the Grassland in association with scattered ponderosa pine stands). Where the fire burned with high intensity these areas have reduced potential for producing this lichen for at least a few decades. The effects of this fire are not expected to affect long-term viability of this species. Other nearby forested areas are expected to provide collection sites for this lichen.

3.11.3 Environmental Effects

3.11.3.1 Direct and Indirect Effects

Primary habitat associated with the most commonly used cultural use plants is often referred to as “scabland.” No scabland habitat would be disturbed by equipment, intensive livestock use, or prescribed burning. Continued viability of cultural use plants associated with scablands would be expected.

The majority of the riparian habitat in the analysis area would continue to be protected from grazing. No project activities would occur in riparian zones. Habitat for cultural use plants associated with these areas would be maintained. Continued viability would be expected.

Project design criteria (FEIS, Chapter 2, Section 2.5.1) provide that no scabland habitat would be disturbed in any of the three action alternatives. These shallow, rocky soils are not suited to equipment associated with rangeland drill seeding and so are "naturally protected."

These sites have inherent low productivity and so are not experiencing measurable increases in juniper density or natural fuels. Consequently they would not be affected by juniper reduction projects or burning.

These sites also produce very little forage. Existing and proposed grazing seasons occur when these sites are beginning to dry out and so very little livestock use would occur on these sites and is not expected to affect viability of these plants.

The majority of the riparian habitat would continue to be protected from livestock grazing through fencing.

Portions of the scabland habitat presently include non-native invasive plants such as medusahead. Though most habitats appear to be maintaining viable communities of native plants, densities and extent of invasive plants could increase and, therefore, reduce suitable habitat for plants of cultural value.

Monitoring of plants of cultural value has not occurred. However their habitat is assumed to be stable and, except for some damage by off-highway vehicle traffic, has changed little over the last few decades.

Measurable impacts from increases in recreation and other uses are not foreseen on habitats associated with cultural use plants.

Long-term effects of non-native invasive species on plants of cultural value are unknown. If soils remain undisturbed invasive plants are less likely to become established in habitats suited for cultural species. Scabland plant species such as *Lomatium* appear to be maintaining viability with these exotic annual grasses such as medusahead short term. Habitat for species associated with scablands appears to be stable and is expected to remain suitable for these species.

3.11.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

Monitoring of these species has not occurred. However, scabland habitat associated with these species appears to be stable, and, except for some damage by off-road vehicle traffic, has changed little over the last few decades. Within the analysis area, the majority of scabland habitat presently includes small amounts of exotic annual grasses, such as cheatgrass. These species could increase in density and affect plants of cultural value associated with these sites. However, these sites appear to be maintaining native plant species as the dominant vegetation. Scabland plant species, such as *Lomatium*, appear to be maintaining viability with these exotic annual grasses. Long-term effects of exotic grasses on these species are unknown, but if associated soils remain undisturbed, effects of exotics are less apparent. With all of the ongoing and future foreseeable actions (Appendix Y) in addition to the actions proposed in this FEIS, habitat for species associated with scablands is expected to remain suitable for at least the next decade, and continued viability is expected.

Cultural use plants associated with riparian areas are expected to remain viable, as the majority of riparian areas on the CRNG are in good condition, protected from grazing, and are expected to remain as such. Measurable impacts from increases in recreation and other uses are not foreseen on habitats associated with cultural use plants.

3.11.4 Forest Plan Consistency

All alternatives are consistent with the LRMP direction stated at the beginning of this section.

3.12 Recreation

3.12.1 Current Management Direction (LRMP, FSM, etc.)

3.12.1.1 The National Recreation Agenda has Five key areas:

- Improve the settings for outdoor recreation.
- Protect and restore natural character.
- Improve Visitor satisfaction with our facilities and service.
- Improve educational opportunities for the public about the values of conservation, land stewardship, and responsible recreation.
- Establish professionally managed partnerships and intergovernmental cooperative efforts.

3.12.1.2 Recreation Standards and Guidelines (LRMP 1989)

3.12.1.2.1 Grassland-wide Recreation Standards and Guidelines

- Construct and maintain the trail system to the standards suitable for type and amount of use. Minimize impacts to trails from management activities. Maintain trails to: prevent resource damage, protect the investment in the system, and provide for user safety.
- Limit use or implement other techniques as needed to prevent or reduce erosion. This includes preventing or reducing erosion associated with other management activities.

3.12.1.2.2 Management Area Standards and Guidelines

- Recreation Opportunity Standards (see below) for rural, roaded natural, and semi-primitive, non-motorized are to be met for activities within the following management areas (LRMP page 4-95):
    - Antelope Winter Range (MA-G1)
    - Metolius Deer Winter Range (MA-G2)
    - General Forage (MA-G3)
    - The Crooked River Recreation Area (MA-G6)
    - The Deschutes River Scenic Corridor (MA-G7)
    - Squaw Creek (MA-G8)
    - Rimrock Springs Wildlife Area (MA-G10)
    - Lake Billy Chinook View Area (MA-G13)
    - Dispersed recreation (MA-G14)
- The desired future condition for the area immediately around dispersed sites will exhibit a natural appearance, although management activities may be highly visible nearby. Protecting the natural environment in and around dispersed campsites is required for:
    - Antelope Winter Range (MA-G1)
    - Metolius Deer Winter Range (MA-G2)
    - General Forage (MA-G3)
    - Dispersed Recreation (MA-G14).

3.12.1.2.2.1 Recreation Opportunity Spectrum

Recreation Opportunity Spectrum (ROS) settings range from Rural and Roaded Natural to Semi-primitive, non-motorized.

3.12.1.2.2.1.1 Rural setting - characterized by a natural environment that has been substantially modified by; development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil.

3.12.1.2.2.1.2 Roaded Natural - characterized by predominantly natural appearing environments with moderate evidence of the signs and sounds of man that usually harmonize with the natural environment. Resource modification and utilization practices are evident but harmonize with the natural environment.

3.12.1.2.2.1.3 Semi-Primitive, Non-Roaded - characterized by a predominantly natural or natural-appearing environment of moderate to large size (Skelton 2004).

3.12.1.3 Scenic Standards and Guidelines (LRMP 1989, page 4-103)

- Manage for the Visual Quality Objectives (VQOs) listed for each management area.
- Where natural catastrophes such as large wildfires, insect epidemics, or wind throws occur, management activities may differ from stated VQOs.
- In areas of the Grassland managed for a VQO of "Modification" or "Maximum Modification", be sensitive to the needs of the viewing public. Use cost-effective visual management techniques while meeting the emphasis of the management area. Examples of these techniques may include the construction of facilities, roads and other physical structures with native materials where possible.

Table 3-64 below presents the Visual Quality Objectives (VQOs) for each of the LRMP management areas on the Grassland.

Table 3-64 Visual Quality Objectives by Management Area.

Visual Quality Objective	Management Area
Modification - requires that vegetation manipulation projects for winter range habitat improvement be designed to conform in size, shape and color to the natural terrain, to the degree practicable.	Antelope Winter Range (MA-G1)
	Metolius Deer Winter Range (MA-G2)
Retention - human activity may be evident but is subordinate to the landscape.	The Crooked River Recreation Area (MA-G6)
	The Deschutes River Scenic Corridor (MA-G7)
	Squaw Creek (MA-G8)
	Rimrock Springs Wildlife Area (MA-G10)
	Cove Palisades State Park (MA-G12)
	Lake Billy Chinook View Area (MA-G13)
	Dispersed Recreation (MA-G14)
Maximum Modification - human activity can dominate the characteristic landscape but appears as a natural occurrence when viewed as a background.	General Forage (MA-G3)

3.12.1.4 Wild and Scenic River Corridor Standards and Guidelines (LRMP)

The following standards and guidelines are to be applied to the Middle Deschutes and Lower Crooked River Wild and Scenic river corridors.

- Maintain vegetative diversity while focusing on ecological conditions between mid and late seral status, allowing only those projects that promote vegetative diversity.
    - Early seral conditions will be provided as necessary to provide habitat for animal species dependent upon this ecological status.
- Deer winter range and other big game areas within the river corridors will generally be managed to attain a 40/60 cover/forage ratio.
    - The maximum distance for cover to any point in forage area will not exceed 1,200 feet. Thermal cover units will generally be a minimum of 20 acres and larger on National Grassland.

- Prescribed burning and conditional fire suppression could be used to allow the upland slopes to return to a natural fire-dependent watershed ecosystem.
    - Fires, which would not threaten or damage private property or other primary values of the corridor, may be allowed to burn.
- Most scenery values remain protected by steep terrain and limited public access.
    - Activities within areas on public lands having high or sensitive visual quality may be permitted if they would not attract attention or leave long-term adverse visual changes on public land.
    - Any new projects within the corridor will require visual contrast analysis to ensure that scenery values are not adversely impacted.
    - Adjacent landowners will be encouraged to consider scenic values in their land use and property management activities.
- The recreation management setting contributing to scenic values will have the Recreation Opportunity Spectrum classification of Semi-Primitive Non-Motorized between the canyon rims and Semi-Primitive Motorized upon the plateaus.
    - All lands within the wild and scenic river corridor will be managed to protect, or where possible enhance, Visual Resource Management (VRM) classifications for retention between the canyon rims and partial retention upon the plateaus.
- A combination of grazing (on the plateaus), juniper thinning, vegetation manipulation, fire management strategies, and other vegetation and wildlife habitat enhancement tools will be used to manage the upland environment and protect scenic values.
    - Chemical management within the corridors' upland areas will be allowed only when no other vegetation management tools are more appropriate or it is the best technique to meet plan objectives.
    - Naturally appearing enhancement projects will be emphasized.
- Livestock grazing within the upland canyon (between the canyon's rims) and riparian areas will no longer be allowed.
    - Livestock grazing on public lands along the plateaus beyond the canyon rims will be managed to achieve an upward trend in ecological condition.
    - Gap fencing on public lands will be constructed along the rims in active grazing allotments where natural features don't exist to exclude livestock from accessing public lands between the rims.
    - Existing upland water sources will be developed upon the plateaus for better livestock and wildlife distribution and forage utilization.

3.12.2 Affected Environment

Refer to Map 11 – Alternative C – Proposed Action with Recreation and Map 12 – Alternative D with Recreation for the locations of all of the recreation sites discussed under this section. The demand for recreation opportunities and facilities is rapidly growing in the Central Oregon area. New technology makes access to public land recreation easier. Four-wheel drive vehicles extend the capabilities of people to reach remote locations; even traveling far off designated roads to reach desired locations. Mountain bikes allow a new kind of access to a variety of settings. New types of outdoor equipment make it possible for more people to travel in comfort to places that were previously remote and unreachable. Global Positions System (GPS) units have created new recreation uses, such as geocaching, and give more people security and confidence in accessing remote, primitive areas. These advances and changes have created demand for new types of recreation opportunities and/or assist users to access public lands in new and different ways.

According to data collected by the National Visitor Use Monitoring Project for the Ochoco National Forest (and including the Grassland) there were 630,115 visitor use days for the calendar year 2000. The project identified the top five recreation activities of those visitors as: viewing wildlife/nature, viewing scenery, primitive camping, fishing and hiking/walking. The top five

primary activities identified were: developed camping, viewing wildlife/nature, hunting, horseback riding and general relaxing (Skelton 2004).

3.12.2.1 History

Vegetative changes have altered the human use of the landscape. Due to the increased density of western juniper, collection of juniper for fuel wood has increased and a new market has developed in the collection and sale of juniper boughs for use in floral design. The rapidly increasing recreational use of the landscape focuses more attention on management activities that manipulate vegetative cover. Juniper provides the primary shade cover for recreational users as well as visual variety across the landscape.

No developed recreation opportunities existed on the Grassland prior to its designation as a National Grassland in 1960. Activities that likely were occurring during that time were dispersed in nature, such as hunting, woodcutting and pleasure driving.

From 1960 through the 1980s the population increased at a relatively slow rate in central Oregon. Recreation use also increased but was not a primary use on the Grassland during this period. Haystack Reservoir, constructed in 1957-58 by the Bureau of Reclamation provided the setting for the development of Haystack Campground in 1964. This development provided the first developed recreational facility within the Grassland boundaries.

During the early 1970s a few horse endurance race events were permitted. These led to the development of the Ridge Rider Trail.

During the late 1980s the population in central Oregon began to increase rapidly. This generated a proportional increase in recreation demand, which resulted in the development of a number of new recreational facilities. These facilities included: Rimrock Springs Trailhead and Trail, Cyrus Horse Camp, Gray Butte Trailhead and Trail, Skull Hollow Campground, Henderson Flat OHV Trail System, Tam-a-lau Trail, and Alder Springs Trailhead and Trail.

The Grassland currently provides a variety of year-round, developed and dispersed recreation opportunities including: hiking, hunting, horseback riding, camping, water sports, fishing, mountain biking, rockhounding, Off-Highway-Vehicle (OHV) riding, bird watching, driving for pleasure, etc.

The setting consists primarily of juniper-woodland and open sagebrush steppe with some ponderosa pine in river canyons and on the west side.

The heaviest recreation use is concentrated around areas of topographic relief (Gray Butte, Crooked River, Deschutes and Squaw Creek Canyon) and water resources (Haystack Reservoir, Lake Billy Chinook, Squaw Creek, Crooked River and Deschutes River). These areas also offer the greatest degree of vegetative variety, i.e., old growth juniper, large sagebrush, etc.

3.12.2.2 Recreation Facilities

There are nine developed sites, including trailheads, and 55 miles of trails on the Grassland (see Recreation Report, for descriptions of each site and trail). Tables 3-65 and 3-66 list the developed recreation sites and trails on the Grassland and identify the Recreation Opportunity Spectrum (ROS) setting and Visual Quality Objectives (VQOs) for each.

Table 3-65 Developed Recreation Sites, CRNG, 2003.

Developed Site Name	Site Type	ROS	VQO
Haystack Reservoir	Campground	Rural	Retention
Cyrus Horse Camp	Horse Camp	Roaded Natural	Retention
Skull Hollow	Primitive Campground	Roaded Natural	Retention
Rimrock Springs	Trailhead	Rural	Retention
Gray Butte	Trailhead	Roaded Natural	
Alder Springs	Trailhead	Semi-Primitive Non-Motorized	Retention
Ridge Rider	Trailhead	Roaded Natural	
Henderson Flat OHV	Trailhead	Roaded Natural	Retention

Table 3-66 Trail Summary, Grassland, 2003.

Name & No.	Length (miles)	Type Use	ROS
Gray Butte #852	6.0	Mountain Bike, Hiker, Horse,	RN
Rimrock #851	1.5	Hiker only	R / SPNM
Ridge Rider #854	20	Hiker, Mountain Bike, Horse,	RN
Henderson Flat OHV Trail System #853	17.0	OHV, Mountain Bike, Horse, Hiker	RN
Alder Springs #855	4.0	Hiker only	SPNM
Old Bridge #855A	0.25	Hiker only	SPNM
Tam-a-lau #856	6.0	Hiker	SPNM

NOTE: Horse and mountain bike use is only permitted on the Peninsula segment of the Tam-a-lau Trail.
RN – Roaded Natural
R – Rural
SPNM – Semi-Primitive, Non-Roaded

Seasonal and yearlong road closures limit motorized access to designated routes only.

3.12.2.3 Wild and Scenic Rivers

There are segments of two congressionally designated Wild and Scenic River Corridors (Middle Deschutes and Lower Crooked) located within the Grassland Administrative boundary

The Bureau of Land Management (BLM), Forest Service, and Oregon State Parks Department jointly manage the river corridors. The Prineville BLM District office acts as lead management agency. Management direction is provided by the Middle Deschutes/Lower Crooked Wild and Scenic Rivers Management Plan (1992).

The Outstandingly Remarkable Values (ORVs) associated with the Grassland portion of the Middle Deschutes river corridor include:

- Scenery
- Recreation
- Geology
- Hydrology
- Fisheries
- Wildlife
- Cultural (prehistoric/historic/traditional)
- Botanical/ecological

ORVs associated with the Lower Crooked River corridor include:

- Scenery

- Recreation
- Geology
- Hydrology
- Wildlife
- Botanical/ecological

Significant values associated with the Lower Crooked River corridor include:

- Fisheries
- Cultural (prehistoric/historic/traditional)

3.12.2.4 Special Management Areas

There are three special management areas within the administrative boundaries of the Grassland. These include the Squaw Creek Management Area (MA-G8), Cove Palisades State Park (MA-G12), and the Lake Billy Chinook View Area (MA-G13).

3.12.2.4.1 Squaw Creek Management Area (MA-G8)

The Squaw Creek Management area includes approximately 7,840 acres of which approximately 1,370 acres are managed as a scenic river corridor. The remainder, approximately 6,470, is to be managed as semi-primitive recreation with a ROS setting of Semi-Primitive, Non-Motorized, while protecting and enhancing deer winter range habitat and fisheries. Fire occurrence is to be evident where prescribed fire and wildfire from natural and human caused starts occur. The VQO for the management area is retention.

Livestock grazing within the proposed "scenic" portion of the corridor (1,370 acres) is not permitted (LRMP page 4-77).

3.12.2.4.2 Cove Palisades State Park (MA-G12)

Cover Palisades State Park includes approximately 2,690 acres of Grassland lands managed by the State of Oregon under a 50-year cooperative agreement with the Forest Service. This agreement was renewed in 1990. The State of Oregon is responsible for the development and maintenance of all recreational facilities. The Grassland retains responsibility for the management of minerals and fire management. The VQO is Retention. No ROS setting was identified for this site because it is a State Park.

3.12.2.4.3 Lake Billy Chinook View Area

The Lake Billy Chinook View Area includes those Grassland lands visible from Lake Billy Chinook and outside the boundaries of the Cove Palisades State Park but within the administrative boundaries of the Grassland. It includes approximately 560 acres of Grassland lands. The VQO is retention. The ROS setting is semi primitive non-motorized.

3.12.2.5 Other Recreation LRMP Management Allocations

3.12.2.5.1 Dispersed Recreation – MA-G14

This allocation applies to dispersed sites across the Grassland. These sites are generally located along roads with many located near riparian areas and streams. While dispersed recreation includes a range of activities such as: driving for pleasure, camping, picnicking, shooting, off-road/trail OHV use, hiking, hunting, fishing, horseback riding and mountain biking. Approximately 80 percent of the total recreation use on the Grassland and Ochoco National Forest is represented by dispersed recreation (Skelton 2004). Dispersed recreation sites are considered to be undeveloped areas out of which dispersed recreational activities are based. LRMP prescriptions for dispersed sites apply to the actual sites and the influence area immediately around them (LRMP page 4-38).

Dispersed use often occurs in concentrated areas including: Boyce Corral, Squaw Creek, Gray Butte/Cyrus Hills, Pine Ridge, Buck Butte and the Canadian Bench area adjacent to Three Rivers and Fly Creek. There is no current physical inventory of dispersed sites on the Grassland. It is estimated that there are more than 100 of these areas across the Grassland (Skelton 2004).

Dispersed use is increasing rapidly due to: easy, close, and year-round access, and a growing demand associated with a growing population.

The ROS setting for this allocation is roaded natural or rural. The LRMP (page 4-39) states that the desired future condition is that dispersed sites will exhibit a natural appearance, although management activities may be highly visible nearby.

3.12.2.5.1 Recreational Special Uses

There are 15-20 authorized annual events and two short-term, one year Outfitter Guide permits issued on the Grassland. There are also several permitted outfitter/guide activities occurring under permits issued by other Forest Offices (i.e. Deschutes, Mt. Hood, Willamette National Forests).

Permitted activities or events include the following:

- Field Dog trials (Boyce Corral)
- Horse Endurance events
- Wagon trains
- Archery/Black Powder shoots
- Family reunions

Outfitter/guide permitted activities include the following:

- Mountain Bike tours
- Horseback rides
- Hunting;
- Hiking and Backpacking

There is an increasing demand for permitted recreation events and/or outfitted and guided use.

3.12.3 Environmental Effects

3.12.3.1 Direct And Indirect Effects

For a more comprehensive discussion of environmental effects related to recreation refer to the Recreation report in the analysis file for this project.

Refer to Map 11 – Alternative C – Proposed Action with Recreation and Map 12 – Alternative D with Recreation for locations of the recreational sites discussed in this section.

3.12.3.1.1 Alternatives A and B

Indirect and direct effects on developed recreation sites, trails, special management areas, wild and scenic river corridors, or scenic resources under Alternatives A or B include the following:

Livestock grazing is not currently allowed within the special management areas or the wild and scenic river corridors. Eliminating grazing in Alternative A will have no effect on these resources.

Other conflicts between grazing and recreational uses would be eliminated under Alternative A but would remain under Alternative B. Alternative A would eliminate manure associated with cattle grazing in Cyrus Horse Camp area, dispersed campsites, trails, etc. Alternative B would retain current levels of grazing resulting in continued complaints from people using some or all of these sites.

Neither alternative would remove water developments. In Alternative A, water developments would not be operated or maintained. Water developments would remain functional and available for use by recreational horse users under Alternative B.

Trail tread and facility effects from cattle use include, but are not limited to: widening of trails from the existing standard; breaking down the edges of trails where construction is benched; kicking out constructed water bars; adding to water run-off from the trail; making new trails where cattle trails leave existing trail treads; knocking down constructed trail markers; and rubbing and knocking down sign posts. Under Alternative B, ensuring that salting areas for livestock are not adjacent to trails (see FEIS, Chapter 2, Section 2.5.6.2) will reduce the incidence of recreational users encountering high levels of trampled vegetation, "dust bowls", and will prevent livestock induced damage to trail treads and facilities.

Alternative B would remove no interior fence lines. There would be continued maintenance and replacement costs associated with: cattleguards, gates and other related structures necessary to keep livestock in the pasture or allotment but allow trail users to cross fence lines. Movement between pastures and allotments would be limited to existing fence crossings thus limiting unrestricted movement across the landscape by recreational horse users.

The risk of unauthorized cross-country travel by motorized vehicles would remain at the same level as today. There would be no changes in impacts to soils, wildlife, or heritage resources short through long term.

Over the next ten to twenty years, juniper expansion may reduce some views and vegetative variety but would increase available shade and create a juniper woodland environment.

Catastrophic wildfire could have impacts to recreation facilities and trails, however, it is expected that facilities would be reconstructed following such an event, and over the long term use would continue to be used.

3.12.3.1.2 Alternatives C and D

Under Alternatives C and D, the presence and smell of livestock and manure associated with continued grazing near both developed and dispersed recreation sites would continue to affect some visitors.

Continued grazing within Cyrus campground would continue to result in livestock rubbing on the signs, tables, and corral facilities. This results in increased recreation costs for maintenance, repairs and replacement.

Some of the juniper density control and prescribed burn units are near either developed or dispersed recreation sites. Visitors to the sites during burning operations would experience short-term increased traffic and would see and probably smell smoke. Blackened vegetation would be evident to visitors for up to several years following treatment. Some recreation areas could also be closed during burning operations. Prescribed burning and juniper treatments could reduce the risk of a high intensity, high severity wildfire. This would reduce the risk of damage and/or destruction of facilities and infrastructure.

Additionally, under these alternatives there would be increased noise and dust associated with tilling and seeding. Increased dust levels would also be expected until tilled and seeded areas were re-vegetated (approximately one growing season).

3.12.3.1.2.1 Developed Sites

Haystack Campground

The proposed chainsaw juniper treatment addresses two of the five key areas of the National Recreation Agenda and maintains the "Old West" theme described in the Ochoco Recreation Strategy. The treatment will improve the setting for outdoor recreation, and it will protect and restore the natural character of the area. (Recreation Report).

Grazing does not occur close enough to these facilities to measurably impact visitors.

Cyrus Horse Camp

Treatment Unit 26 is approximately one-quarter mile from this site. Treatment of Unit 26 would have no effect on: the ROS classification, the site VQO, desired future condition or management emphasis under either alternative.

Neither alternative addresses any of the National Recreation Strategy's key areas for this site.

Skull Hollow Campground

Unit 23 is within one-quarter mile of this site under both alternatives. Both would treat approximately half of the 156-acre treatment unit using a combination of chainsaw cutting of juniper and prescribed fire. Treatment of Unit 23 would have no effect on: the ROS classification, the site VQO, desired future condition or management emphasis under either alternative.

Neither alternative addresses any of the National Recreation Strategy's key areas for this site.

Gray Butte, Rimrock Springs, Alder Springs, and Henderson Flat Trailheads

Treatments proposed for Units 30, 32 and 65 would affect the Henderson Flat OHV Trailhead and Staging Area. These units are adjacent and/or near the trailhead and staging area for this trail system, however, the ROS classification of Rural would be met at the trailhead. Otherwise, treatments proposed under both alternatives do not affect the: ROS classifications, VQOs, desired future condition designations or management emphases for the Gray Butte, Rimrock Springs or Alder Springs Trailheads

The proposed activity meets one of the National Recreation Strategy's two key areas that deal with setting. Specifically, it will protect and restore natural character and maintain the "Old West" theme as defined in the Ochoco Recreation Strategy.

3.12.3.1.2.2 Trails

Gray Butte Trail #852

Treatment Unit 25 includes approximately one mile of this trail in both alternatives. Approximately one third, or approximately 107 acres, would be treated. The proposed treatment would not, under either alternative, affect: the ROS classification, the VQOs, the desired future condition, or the management emphasis for the trail. The treatment area is open country with little or no large tree component.

Rimrock Springs Trail #851

Both alternatives propose juniper thinning followed by tilling and seeding on approximately 541 acres in Unit 29. This unit is across Highway 26 from the trail and therefore, would not occur immediately adjacent to the trail, although some portion of the treated unit may be visible from the trail. Depending upon the seeding treatment (tillage vs. inter-seeding, etc.) treatment may be noticeable within the mid to background during the first season following treatment. However, after the first year, due to the mosaic nature of the seedings, the treatments would not likely be noticeable to the casual visitor. With increasing numbers and distribution of native vegetation, the "managed" appearance would be expected to change to a natural appearing landscape that would meet the VQO of retention.

Alternative C proposes chainsaw cutting of juniper on approximately 1,155 acres in Unit 85, which is also visible from some points on the trail. Long term, treating this unit would not affect: the

ROS classification, the VQOs, the desired future condition, nor the management emphasis for the trail. In addition, treating this unit would not affect any of the National Recreation Strategy's key areas. This unit is not proposed for treatment under Alternative D.

Ridge Rider Trail #854

Both Alternatives C and D propose approximately 3,707 acres of vegetation treatments including juniper cutting, prescribed fire, tilling and seeding, or a combination of treatments adjacent to this trail. Treatments proposed under Alternative C affect approximately 12.75 miles of trail. Alternative D treatments affect approximately 9.25 miles of trail.

Approximately 2.5 miles of trail are affected by prescribed fire or a mix of prescribed fire and chainsaw cutting of juniper in treatment Units 23, 25, and 26.

Approximately 2.75 miles of trail would be affected by chainsaw thinning of juniper in treatment Units 30, 31, 34, 63, and 65 under both alternatives. Alternative C would affect approximately 3.5 miles of additional trail by chainsaw cutting juniper in Unit 69.

Approximately four miles of trail would be affected by a combination of chainsaw thinning, tilling and seeding. The effects of the thinning would be the same as described above for the Rimrock Springs Trail #851.

During the first growing season treatment areas would not appear to be predominately natural appearing with moderate signs and sounds of man. However, after the first growing season, the ROS classification would be met within the area by exhibiting a more natural appearing landscape.

Both alternatives address two of the five key areas of the National Recreation Agenda and maintain the "Old West" theme described in the Ochoco Recreation Strategy. The treatment will improve the setting for outdoor recreation and it will protect and restore the natural character of the area.

Henderson Flat OHV Trail System #853

Treatment Units 30, 32, and 65, totaling approximately 757 acres within the 1,400 acres Henderson Flat OHV Area, would affect approximately 12.5 miles of the 17-mile trail system. Existing vegetation, including juniper, was used to: define the trail system, keep motorized vehicles on the designated routes and control speed (Recreation Report 2004). In order to maintain the effectiveness of management of the trail system, and keep riders on designated routes, it will be very important to limit the removal of juniper of any size adjacent to designated trails (FEIS, Chapter 2, Section 2.5.6.2).

Both alternatives address two of the five key areas of the National Recreation Agenda and maintain the "Old West" theme described in the Ochoco Recreation Strategy. The treatment will improve the setting for outdoor recreation, and it will protect and restore the natural character of the area.

Alder Springs Trail #855 and Old Bridge Trail #855A

Treatment of Unit 67 under Alternative C, would affect approximately two miles of the Alder Springs Trail and all (approximately 0.25 miles) of the Old Bridge Trail. While the proposed prescribed burn would occur across the trail, there would be little to no evidence to indicate that the burn was not of natural origin. The LRMP indicates that fire occurrence in this area is to be evident where prescribed fire and wildfire from natural and human caused starts occur.

There would be no effects on either trail under Alternative D. Unit 67 would not be treated under this alternative.

Neither alternative would have measurable effects on: VQOs, ROS classifications, desired future condition designations, or management emphases for these trails. Neither alternative would affect or address the National Recreation Strategy's key areas.

Tam-a-lau Trail #856

Approximately two miles of the southern portion of this trail are adjacent to treatment Unit 49, which is proposed for a cool spring prescribed burn to reduce shrub cover under both alternatives. While the VQO of maximum modification will also not be measurably affected as human activities are not expected to be evident to the casual observer.

Alternative C treatment addresses one of the five key areas - protecting and restoring the natural character of the area, however, it would not improve the setting for outdoor recreation. Alternative D addresses two of the five key areas of the National Recreation Agenda and maintains the "Old West" theme described in the Ochoco Recreation Strategy. The treatment will improve the setting for outdoor recreation and it will protect and restore the natural character of the area.

Treatment Unit 79 (part of Alternative C but not included in Alternative D) would cut juniper on an additional 592 acres along approximately six miles of the trail. Alternative C treatments would be consistent with the Roaded Modified and Roaded Natural settings of the General Forage Management Area designation.

Because the Peninsula Allotment would be closed to grazing, visitors would not be faced with the sight or smells of livestock or manure. An absence of livestock in this area would also eliminate damage to signs and other improvements associated with livestock rubbing. Reducing maintenance, repair and replacement costs associated with those improvements. An absence of livestock would also eliminate the impacts of livestock using.

Table 3-67 compares the miles of developed trails potentially affected by proposed treatment activities by alternative.

Table 3-67 Miles of Developed Trails Impacted by Proposed Treatments, Alternatives C and D.

Trail Name & Number	Approx. Miles of Trail Affected	
	Alt C	Alt D
Gray Butte #852	1.0	0.75
Rimrock Springs #851	0	0
Ridge Rider #854	12.5	9.5
Henderson Flat OHV System #853	12.5	12.5
Alder Springs #855	2.0	0
Old Bridge #855A	0.25	0
Tam-a-lau #856	6.0	2.0
Total Miles	34.25	24.75

3.12.3.1.2.3 Dispersed Sites

Effects on immediate areas around dispersed sites are dependent upon: the type of treatment proposed, the location of the site relative to the treatment, and the vegetation within and adjacent to the site. Possible effects of these actions are a degraded recreational experience due to:

- Changes in vegetative cover.
- Increased number of stumps.
- Presence of juniper slash.
- Reduced shade.
- Increased traffic presence of smoke, presence of blackened vegetation, and increased snags from prescribed fire.
- Noise and dust from large machinery tilling and seeding.
- Blowing dust from areas tilled and seeded until vegetation is established.

Maintenance of natural appearing environments immediately adjacent to dispersed sites (see Chapter 2, Section 2.4.6.3) will ensure meeting the VQO of retention and the ROS classification of roaded natural. This will be consistent with LRMP direction (page 4-39) of having dispersed sites exhibit a natural appearance, although management activities may be highly visible nearby.

3.12.3.1.2.4 Squaw Creek Management Area

Both alternatives propose thinning juniper with chainsaws on approximately 549 acres in treatment Units 53 and 54 within the Squaw Creek Management Area but outside of (although adjacent to) the proposed scenic portion of the corridor for a distance of approximately one half mile.

With Alternative C, treatment Unit 67 proposes an additional 1,752 acres to be treated using prescribed fire along approximately five miles of the Squaw Creek corridor.

Most activities would not be visible from the river. Those activities within river corridors and which are visible (such as those occurring within the Squaw Creek drainage) are consistent with LRMP management direction which allows for mule deer habitat enhancement and prescribed fire as legitimate treatments within this management area.

3.12.3.1.2.5 Deschutes Wild and Scenic River, and the Crooked River Wild and Scenic River

Alternatives A, C, and D would close the Clevenger and Goldmine/Falls grazing allotments. This would eliminate the opportunity for livestock to enter the canyon portion of the Deschutes Wild and Scenic River Corridor at that point. Alternative B would not close the Clevenger and Goldmine/Falls grazing allotments. Additional fencing and upland water development would need to be constructed in order to utilize these allotments without violating the Middle Deschutes/Lower Crooked Wild and Scenic Rivers' Management Plan in the Grassland portion of the Middle Deschutes Wild and Scenic River.

Alternative C proposes approximately 1,446 acres of juniper thinning (treatment Units 76 and 78) and approximately 639 acres (treatment Unit 68) of prescribed fire on the plateaus within and adjacent to the Middle Deschutes Wild and Scenic River Corridor. Chainsaw thinning would affect approximately two and one half miles of the corridor; prescribed fire, approximately three quarters of a mile of the corridor.

Alternatives C and D, (treatment unit 36), propose juniper thinning and tilling on 214 acres of plateau land above the canyon rim which is adjacent to approximately 0.50 miles of the Crooked River Scenic Corridor.

None of these activities would be visible from the rivers and, while they may be within the river corridors, they meet the standards and guidelines as set out in the Middle Deschutes/Lower Crooked Wild and Scenic Rivers' Management Plan. These activities are not expected to impact any of the outstandingly remarkable values of either river corridor.

3.12.3.1.2.6 Special Use Permits

Most special use permit activities and events occur in the Boyce Corral and Gray Butte areas of the Grassland. In general, effects on these activities would be similar to those described for chainsaw thinning, prescribed fire, and tilling and seeding near or adjacent to developed sites and trails. However, the timing, location and/or type of treatment may require that some events be postponed, moved or cancelled. Field dog trials at Boyce corral occur in the spring and fall each year. Both alternatives propose treatment in Unit 8 with chainsaw thinning, tilling, seeding, and fertilizing of 684 acres, which would require coordination on the timing of these events relative to timing of treatments. The field dog trials utilize areas within the treatment area for some of their events.

Changes and/or reductions in vegetative cover may impact the bird hiding cover for approximately one growing season.

Horse endurance race events and poker rides are held two to four times annually. Past events have been staged from Skull Hollow, Boyce Corral, Trail Crossing Corral, and Cyrus Horse Camp. Most utilize all or parts of the Ridge Rider Trail and other existing roads/user trails in the same area. Coordination with these user groups may be necessary to ensure that treatment implementation does not cause postponement, or cancellation of any of these events.

There are two outfitter guide permits, (one for guided mountain bike tours and one for guided horseback riding) on the Grassland that use all of the trails in the Gray Butte area. Their use is not scheduled ahead of time but is determined by client choice. There are also several guided hikes annually on the Gray Butte Trail that are authorized under permits administered by the Deschutes National Forest. The effects to these users would be the same as for other trail users (see Section 3.12.3.1.2.2, Gray Butte Trail, and Ridge Rider Trail). As part of the guide special use permit administration guides will be informed of the timing of treatments, far in advance so that they have an opportunity to adjust their schedules and routes accordingly.

Other events occur at various sites across the Grassland landscape.

3.12.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

3.12.3.2.1 Alternative A

Increasing numbers of recreational users will increase, the number of conflicts between user groups, and competition between those groups for the same landscape.

The lack of planned, integrated, juniper density management increases the risk of wildfire damaging or destroying recreational facilities and infrastructure under both Alternatives A and B. Although limited amounts of juniper control may continue to be planned and implemented it would be limited and would not provide protection at either a watershed or landscape scale.

Skull Hollow Campground, a recreational facility located within the boundaries of the foreseeable future Skull Hollow prescribed burn project, would experience reduced risk of a high intensity, high severity wildfire as a result of this project. This would reduce the risk of damage and/or destruction of facilities and infrastructure in the event of a wildfire. People recreating within or adjacent to this area during project implementation may experience short term impacts such as smoke, blackened vegetation, change in vegetative cover, noise from chainsaw cutting and the smell of two-stroke combustion.

Similar impacts would be expected for other similar foreseeable future fuels reduction projects that may be planned and implemented that also include recreation sites, facilities, or infrastructure.

Alternative A provides no recreation related incremental effect, as it proposes no actions or activities.

The proposed activities will not measurably effect: the ROS classification, the VQOs, the desired future condition, or the management emphases for Recreation or Scenery Management. Removing grazing and fences will create a more natural appearing environment. The action meets two of the National Recreation Agenda's key areas dealing with setting; enhancing the recreation setting, and restoring the natural character. Removing cattle will remove some of the "Old West" character as defined in the Ochoco Recreation Strategy.

3.12.3.2.2 Alternative B

Current management practices, including reasonably foreseeable future actions, will have short-term impacts on: the ROS classification, the VQOs, the desired future condition, and the management emphases for Recreation and Scenery Management on some of the recreation sites. Grazing will continue to have impacts as described in the indirect/direct effects section. The on-going management actions would move towards meeting two of the National Recreation Agenda's key areas dealing with setting; enhancement of the recreation setting, and restoration of the natural character. Continued grazing retains the "Old West" character as defined in the Ochoco Recreation Strategy.

3.12.3.2.3 Alternative C – Proposed Action and Alternative D

Development of a trailhead at the Skull Hollow Campground to access the Ridge Rider Trail would increase traffic and use in the area and at the campground.

The maintenance of shading vegetation along trails during vegetation management activities (FEIS, Chapter 2, Section 2.5) such as juniper thinning with chainsaws and/or prescribed burning would reduce the recreational impact associated with these activities and eliminate an incremental effect to trails.

Prescribed fire produces snags, which represent long-term visual impacts.

Installation of new fences may displace some dispersed use if opportunities to camp near water are no longer available. The construction of 17 miles of new fence under Alternatives C and D represents a three percent incremental increase of fence effects to recreators and recreational opportunities.

Planned rehabilitation work in the Skull Hollow area may affect trail location and use of the trail in the rehabilitation areas.

Proposed activities in each of these alternatives are allowed for and meet the direction contained in the LRMP relative to ROS and VQO settings. In addition, in the longer term the environment should return to a natural appearance where management actions will not be evident to the casual forest visitor. The proposed actions in each of these alternatives would meet two of the National Recreation Agenda's key areas dealing with setting; enhancement of the recreation setting and restoration of the natural character. Continued grazing retains the "Old West" character as defined in the Ochoco Recreation Strategy.

3.12.4 Forest Plan Consistency

Table 3-68 displays LRMP consistency of the various alternatives.

Table 3-68 Recreation Forest Plan Consistency

Management Area	MA-G6 Crooked River Recreation Area MA-G7 Deschutes River Scenic Area MA-G11 Haystack Reservoir MA-G12 Cove Palisades State Park	MA-G6 Crooked River Recreation Area MA-G7 Deschutes River Scenic Area MA-G8 Squaw Creek	MA-G14 Dispersed Recreation	MA-G14 Dispersed Recreation	MA-G3 General Forage	MA-G6 Crooked River Recreation Area MA-G7 Deschutes River Scenic Area MA-G12 Cove Palisades State Park MA-G13 Lake Billy Chinook View Area MA-G14 Dispersed Recreation	MA-G11 Haystack Reservoir MA-G10 Rimrock Springs Wildlife Area	TRAILS Henderson Flat OHV
Standard & Guideline	Allow no livestock grazing	Use prescribed fire to maintain naturalness, provide scenic diversity & vegetative management	Utilize manual and mechanical methods of fire hazard reduction. Prescribed fire may be used under limited circumstances	Protect the natural environment in and around identified dispersed camp sites	Protect the natural setting in and around dispersed sites (unidentified sites may be affected)	Maintain Visual Quality Objective of Retention	Maintain Visual Quality Objective of Retention	Maintain Visual Quality Objective of Modification
Alternative A Consistency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alternative B Consistency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alternative C Consistency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Alternative D Consistency	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3.13 Non-native Invasive Plant Species (Noxious Weeds)

3.13.1 Current Management Direction (LRMP, FSM, etc.)

There are no goals, objectives, desired future conditions, or standards and guidelines specifically for noxious weeds in the LRMP.

3.13.2 Introduction

Non-native invasive plants are plants capable of degrading environmental quality. Noxious weeds are a subset of these plants and designated "noxious" by the Secretary of Agriculture or state agencies. Many use the term "noxious weed" for all invasive, non-native plant species (Shelly et al. 1999a). In this section the two terms are used interchangeably.

The introduction and spread of these plants can reduce the diversity and abundance of native vegetation, forage, diversity, continuity, and quality of wildlife habitat, increase erosion, and decrease water quality. They have developed many characteristics such as rapid growth rates, high seed production, and extended growing periods that give them advantages over native plants (Sheley and Larson 1994a, Shelly et. al. 1999b, Scott and Pratini 1995, Roche and Roche 1998 and USDA/USDI 2000).

Approximately 65,000 acres of the 112,000-acre Grassland were tilled in attempts at crop production during the homesteading era. Prior to the homesteading era the general vegetation across the Grassland included big sagebrush (*Artemisia tridentata*.), bitterbrush (*Purshia tridentata*) and perennial bunchgrasses such as Idaho fescue (*Festuca idahoensis*), Sandberg's bluegrass (*Poa secunda*), bluebunch wheatgrass (*Pseudoroegneria spicata*), basin wildrye (*Leymus cinereus*), squirrel tail (*Elymus elymoides*), needle and thread (*Hesperostipa comata*), and western needlegrass (*Achnatherum occidentale*). In general, these species do not have high seedling vigor (Callihan and Evans 1991), and can be replaced by non-native invasive plants following disturbance. From the 1950s until today non-native annual grasses, such as cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*) have become established on the Grassland.

3.13.3 Affected Environment

A variety of non-native invasive plant infestations occur across the Grassland. Noxious weed surveys are ongoing on the Grassland. There are 39 weed sites encompassing approximately 3,300 acres (Botany Specialist Report). They range from a handful of plants to over two thousand acres with dense infestations. Pre-project surveys were completed in 2000-2002. Less effort has been made to fully document locations of infestations of common weed species such as teasel and Canada thistle.

Most currently known infestations have been present on the Grassland for at least a decade. Weed inventories indicate most infestations begin on disturbed areas such as road shoulders, old fields, old town sites, and recreation sites. Because most infestations occur along roads, primary introduction of noxious weeds appears to be through vehicles. Other vectors include water (streams and canals), wind, livestock, wildlife, mineral material and heavy equipment used for road maintenance and construction projects. Of increasing concern is hay brought in for horses by the recreating public and special use events (dog trials, horse endurance races and others) that may contain noxious weed seed.

Many of these infestations appear to be moving away from roads and disturbed sites and are invading areas that are less disturbed. The Grassland includes many areas currently free of weeds, but due to existing disturbance (e.g. road shoulders and old fields) they are more susceptible to

weed establishment and spread. With continuing activities, the risk of weed introduction and spread to new areas on the Grassland is increased.

Table 3-69 (below) displays species designated as noxious weeds by the State of Oregon or considered to be invasive non-natives on the Crooked River National Grassland.

Table 3-69 Invasive Non-Native Plants CRNG

Common Name	Species	Life History
Whitetop	*Cardaria draba*	perennial forb
Spotted Knapweed	*Centaurea maculosa*	perennial forb
Diffuse Knapweed	*C. diffusa*	perennial forb
Russian Knapweed	*C. repens.*	perennial forb
Yellow Star Thistle *	*C. solstitialis **	annual forb
Canada Thistle	*Cirsium arvense*	perennial forb
Bull Thistle	*Cirsium vulgare*	biennial forb
Morning Glory	*Convolvulus arvensis.*	perennial forb
Teasel **	*Dipsacus sylvestris **	biennial forb
St. John's Wort	*Hypericum perforatum*	perennial forb
Dalmatian Toadflax	*Linaria dalmatica*	perennial forb
Sulfur Cinquefoil	*Potentilla recta*	perennial forb
Medusahead	*Taeniatherum caput-medusae*	annual grass

* On private land

** Not listed as noxious by State of Oregon but considered an invasive non-native on the Ochoco NF/Grassland due to potential for displacing native vegetation

The Grassland is currently managing noxious weeds under the 1998 Integrated Weed Management Plan and Environmental Assessment/Decision Notice (USDA 1995 and 1998) and the Crooked River National Grassland Land and Resource Plan (LRMP 1989) as amended July 25, 1995. A variety of control strategies are used depending on the species, size of infestation, and location. Included are chemical, manual, and biological controls.

Weed densities have generally decreased where controls have been implemented, though on the majority of sites some seed production still occurs from plants that germinate later and re-sprout or otherwise escape control, after incomplete pulling or less than fully effective management measures are taken. As long as seed production continues, eradication cannot occur. This situation is complicated by the persistence of viable seed in the soil for many years. In addition, new infestations are continually occurring from ongoing uses. Some infestations, such as the medusahead sites, are not being treated and continue to expand.

Biological controls (insects and nematodes) have been introduced for some weed species. Ongoing research and monitoring indicates some success in reducing weed densities in central Oregon but an overall assessment of long-term (over the next few decades) effectiveness of biological controls on noxious weeds on the Grassland remains to be completed. However, it should be noted that biological controls of this kind do not eradicate the weed populations, which they prey upon. Rather the populations of the biological control agents and the populations of the target weeds reach equilibrium.

Prevention measures such as requiring weed-free equipment for projects, weed-free livestock feed for permitted events, detection (inventory) to identify new infestations, and early treatment are priorities for the current integrated weed management program.

The Forest Service Pacific Northwest Regional Office is currently completing an Environmental Impact Statement (EIS) for integrated noxious weed management. Integrated weed management

on the Grassland may be modified based on findings and decisions resulting from this EIS process. Decisions and implementation practices based on this EIS are expected in 2005 or 2006.

3.13.3.1 Mineral Materials Sources

Since each mineral materials source provides a potential distribution point for noxious weed spread, it is important to manage these sites with the intent of preventing such spread in mind. Existing mineral materials source on the Grassland and their corresponding descriptions are listed below:

3.13.3.1.1 Boyce Material Source (3.0 ac)

This source is located on Rd 8900-000 in T 12 S, R 13 E, Section 13. The temporarily inactive rhyolite riprap source is in the Deschutes Formation. The source is located in designated Antelope Winter Range. The spotted, Russian and diffuse knapweed present in the site is currently under treatment. Maintenance of this source on inventory is recommended.

3.13.3.1.2 Canal Material Source (3.0 ac)

This source is in a sand and gravel pit, located in T 13 S, R 13 E, Section 22, on Road 5700-680. The pit run source, located in the general forage management area, is closed. This site needs rehabilitation. Maintenance of the source on inventory is recommended until reclamation is complete.

3.13.3.1.3 Cyrus Material Source (9.0 acres)

This source is located in T 13 S, R 14 E, Section 18 on Road 5700-501. The Clarno basalt pit run is active. The source is located in the General Forage Management Area. The site is actively used for pit run on Grassland roads. Jefferson County has expressed a desire to remove pit run for their system. The access road has a gate. Maintenance of the site on inventory for future entries is recommended. The site has spotted and diffuse knapweed, which is being treated.

3.13.3.1.4 Fence Material Source (0.5 acres)

This site is located in T 11 S, R 14 E, Section 34 on Road 5300, within the Antelope Winter Range Management Area. The road is gated and closed. The last entry was in 1992. The temporarily inactive site is in a basalt of the John Day Formation. It has been used for pit run and grid roll in the past. This site is recommended to be maintained on inventory.

3.13.3.1.5 Geneva Material Source (1.10 acres)

Located in T 13 S, R 12 E, Section 4 on Road 6120-120, this site is an active cinder pit run source. It is within the Deschutes Wild and Scenic corridor and general forage. The Deschutes River Wild and Scenic plan identifies the source to be closed and reclaimed. The reserves are almost exhausted. The operator uses approximately 200 cubic yards per year. A long-term development plan with a reclamation plan is needed to complete closure. The public uses this site as a rifle range and local landfill. Maintenance of this site on inventory is recommended until it is reclaimed.

3.13.3.1.6 Grandview Material Source (1 acre)

This site is comprised of an andesite of the Clarno Formation, located in T 12 S, R 12 E, Section 16, on Road 6500-200. The temporarily inactive pit run source is in the Cove Palisades State Park Management Area. Located on acquired land, the site is not available for use, except by public agencies. Recently there has been observed theft of the mineral material. The remoteness and limits law enforcement occurrence and efficacy. The management area standards and guidelines recommend closure of the site. Maintenance of the source on inventory until restoration is complete is recommended.

3.13.3.1.7 Jap Creek Material Source (3.5 acres)

This source is in a Columbia River basalt, located in T 13 S, R 14 E, Section 35, on Road 2600-907. The active crusher/gridroll source has ample reserves with small riprap (1' minus). It has been actively used by the Oregon Department of Transportation (ODOT) over the past ten years. Maintenance of the source on inventory is recommended. Medusahead is along the access road into the source and is creeping into the material source itself.

3.13.3.1.8 McPheeters Material Source (5.7 acres)

This site is in a basalt of the Clarno Formation, located in T 13 S, R 13 E, Section 27, on Road 7290-000. The crusher source is temporarily inactive, having been used in the past by ODOT and Jefferson County. The source is located in general forage. The slopes of the source have been shaped for final reclamation. ODOT completed a rock source investigation in 1997. There are minimal reserves on the east side next to the property line. The recommendation is to maintain this site on the inventory until reclamation is complete.

3.13.3.1.9 Metolius Material Source (21 acres)

This source is comprised of unconsolidated sand and gravel of the Madras Formation, located in T 11S, R 13 E, Section 36, on Road 2600-750. The pit run source is active. Both ODOT and Jefferson County are the primary users. The source is located in the General Forage Management Area. The public uses this site as a rifle range and local landfill. The recommendation is to maintain this site on the inventory.

3.13.3.1.10 Round Butte Material Source (8.5 acres)

This source is comprised of cinders and located in T 11 S, R 12 E, Section 13, on Road 6610-000. The pit run source is active. The primary permittee is ODOT, using the material for winter traction. The source is located in the General Forage Management Area. The most recent permit started shaping the high faces on the lower cut, initiating reclamation. There is a proposal to further reclaim and shape the lower trough. The spotted and diffuse knapweed present on the access roads is currently under treatment. The public uses this site as a rifle range and local landfill. The recommendation is to maintain this site on the inventory.

3.13.3.1.11 Schmoker Material Source (5 acres)

This site is comprised of Columbia River basalt, located in T 11 S, R 14 E, Section 3, on Road 5160-000. This crusher source is active. The primary users of this source are ODOT and Jefferson County road department. The source is located in the general forage management area. A population of medusahead is present on the northern end. It is currently under treatment. The public uses this site for off-highway-vehicle (OHV) use and a rifle range. The recommendation is to maintain this site on the inventory.

3.13.3.2 Individual Weed Species Discussion

3.13.3.2.1 Medusahead

While several species of weeds occur on the Grassland, the annual grass, medusahead occupies the largest area. Medusahead infestations are currently being inventoried and mapped on the Grassland. It occupies approximately 3,000 acres on the Grassland and continues to spread. The largest infestation occurs on Buck Butte and Grizzly Mountain. It is found on a variety of sites including rock pits, roadsides, dispersed camping areas, meadows, old town sites, and others.

The phenology (seasonal growth pattern) of medusahead as a winter annual, allows it to out-compete native species by germinating in the fall. It is especially competitive on disturbed sites. Medusahead infestations appear to have started along road shoulders, power lines, and other disturbed areas. Primary seed dispersal agents include: heavy equipment, vehicles, wind, and

animals. It is more often associated with clay soils. Disturbed clay soils, especially roadsides, are primary pathways for medusahead. This species is known to invade and persist on sites excluded from grazing (Wagner et. al. 2001). Observations indicate that this species occurs in lower densities on sites that are dominated by perennial vegetation. This indicates that perennial vegetation competition increases the amount of time that it takes medusahead to completely occupy and convert a site to a pure medusahead stand.

Both the large areas occupied by this plant as well as its growth habit (very short dense stands creating its own vegetative mulch) make hand pulling unfeasible. Manual control for this species is occurring on the Island Research Natural Area in coordination with the Native Plant Society of Oregon and the Bureau of Land Management. This species is expected to continue to spread but rehabilitation of medusahead sites is possible (Zamora 2000). Most herbicides that show promise in controlling this plant are currently not available for use by the Forest Service. Other measures such as burning and mechanical (e.g. disking) treatments are not usually effective and tend to favor rather than deter this plant species. Treatment of medusahead infestations will be deferred pending other analysis for invasive plant management.

3.13.3.2.2 Cheatgrass and *Ventenata*

Other invasive species present on the Grassland include cheatgrass and *Ventenata* (*Ventenata dubia*). These non-native annual grasses occur throughout the Grassland and can be particularly invasive following disturbance (including fire) that removes vegetation and exposes soils. Ubiquitous throughout the intermountain west, cheatgrass is fast spreading and highly flammable. On the Grassland, densities of cheatgrass are much lower than in other areas of central Oregon, especially on drier sites further north in Wasco County. Establishment of cheatgrass in other areas of central Oregon, often result in increased fire frequency. *Ventenata* is less common and little information is available on this species, but it appears to be more often associated with clay soils. It is currently under study by the Oregon Department of Agriculture for potential noxious listing. With cheatgrass being so common, it is not listed as noxious in Oregon. Estimated acres infested with these species are unknown.

3.13.3.2.3 Spotted and Diffuse Knapweed

Spotted and diffuse knapweeds occur throughout central Oregon and are the most common knapweed species on the Grassland. A trait of these species is the ability of their seed to remain dormant in the soil for up to ten years, making eradication very difficult. These species presently infest approximately 150 acres of the Grassland and are being treated. Where chemical controls have been implemented density of these weeds is decreasing. Some infestations are being treated manually, but resources to complete manual controls are limited. New infestations comprised of single or a few plants are regularly discovered, and most of these are treated by hand pulling. Observations indicate manual controls are resulting in varying degrees of success. Typically diffuse knapweed (a long lived biennial or short lived perennial) is more susceptible to manual treatments than spotted knapweed, which is longer lived, sequestering more of its biomass underground in its roots.

3.13.3.2.4 Other Broadleaf Weeds

Several other weed species are present on the Grassland and fit into the general category of broadleaf weeds. These species include Canada thistle, Russian knapweed, Dalmatian toadflax, St. Johns wort, whitetop, and teasel. During the past half-century many noxious broadleaf species have expanded their range in the western United States. Infestations are often associated with soil disturbance by human activities. Livestock grazing and wildlife foraging may contribute to broadleaf weed spread by selective herbivory. Spiny broadleaf species such as Canada thistle tend to be avoided by livestock. In many cases broadleaf species produce an extensive taproot system that can extract more moisture from deep within the soil profile and so remain green longer into the dry season than do grasses. They also typically produce a large number of seeds (Roché et. al.

1994). These factors (and various others) help noxious broadleaf species out-compete native perennials.

Known infestations of: Canada thistle, Russian knapweed, dalmatian toadflax, St. Johns wort, and whitetop occupy approximately 20 acres of the Grassland. These are rhizomatous species (possess spreading roots) that are likely to continue to expand in spite of manual control measures because new plants form from root segments left in the soil after pulling the above ground portion. Seed from these species can remain dormant in the soil for several years. Canada thistle and Russian knapweed are of particular concern because they readily grow in riparian zones and have the ability to form large patches of rhizomatous growth. Grassland strategy for Canada thistle includes the use of biological agents as a means of control. *Urophora spp.* and *Ceutorhynchus litura* have been released to forage upon Canada thistle and at least one infestation appears to be declining following the establishment of these insects. The majority of other infestations are expanding. *Subanguina picridis* was introduced on an infestation of Russian knapweed and has established, but its expansion has been very slow. *Chrysolina spp.* was introduced decades ago as a biological control agent for St. Johns wort. This insect has established throughout central Oregon, and is expected to occur on the Grassland.

Teasel is another weed species that occurs on the Grassland, especially in riparian areas. Manual control of this species is occurring in the Alder Springs area in coordination with the Native Plant Society of Oregon. Elsewhere in eastern and central Oregon it is so widespread, and manual control resources so limited, it is regarded as a low priority for treatment. Not all infestations have been inventoried.

3.13.3.3 The following questions are addressed as part of the analysis for competing and unwanted vegetation:

3.13.3.3.1 What is the nature and role of associated vegetation?

Approximately 65,000 acres or a little more than half of the Grassland was tilled and farmed by settlers. On both tilled and untilled soils vegetation consists primarily of sagebrush or western juniper plant communities. On the native sites, the native plants species have maintained their dominance. Riparian zones are scattered throughout the area with a few dry ridges and lithosol soil areas (scablands).

3.13.3.3.2 Do conditions exist that favor the presence of competing and unwanted vegetation?

Yes, the tilled soils (less than 10,000 acres) have lost some of the soil organic layer, resulting in increased susceptibility to noxious weeds. These areas also have a relatively high road density. Roads are continuously disturbed areas that serve as corridors for the spread of weeds. Sites fully-occupied with a variety of perennial grasses, forbs and shrubs appear to be less susceptible to introduction and spread of competing and unwanted vegetation (noxious weeds).

3.13.3.3.3 If conditions exist that favor the presence of competing and unwanted vegetation, have past management actions exacerbated the situation?

Yes, the following past management actions have exacerbated the situation: farming, grazing, road construction, tree cutting, burning, recreating, establishment of utility corridors, and trail construction and use.

Introduction and spread of noxious weeds appears largely due to vehicles, although livestock, wildlife, contaminated hay, water, and windblown seed are other sources. Noxious weed infestations are more often associated with roadsides, old town sites, camping sites, corrals,

livestock and wildlife trails, firewood cutting areas and other areas with soil disturbance. However they are not limited to disturbed sites only.

3.13.3.3.4 Do natural controls exist on the site?

Yes, natural controls do exist in the form of existing vegetation and undisturbed soil organic layers. The presence of these natural controls helps to reduce the rate of spread of these weeds outside of roadsides, utility corridors, and other disturbed areas. Non-native biological control agents have been introduced to the Grassland and have established on at least two sites.

3.13.3.3.5 Can management actions be taken that either encourage natural controls or help avoid the conditions that favor the presence of competing and unwanted vegetation?

The following management actions, which can be taken to prevent the further spread of noxious weeds, are included within the design criteria of the action alternatives (FEIS, Chapter 2, Section 2.5). Disturbed ground could be reseeded or allowed to recover naturally if re-vegetation of native or desirable non-native vegetation is expected. Equipment used could be inspected to ensure it is free of noxious weeds. Existing weed infestations (with the exception of medusahead) could continue to be treated under current weed management plans. The analysis area was surveyed for noxious weeds and monitoring could occur following project activities as part of the Ochoco National Forest/Crooked River National Grassland weed management program.

3.13.3.3.6 Is it feasible to undertake the management actions, and if not, why? If undertaken, are impacts on other Forest Service objectives and goals acceptable?

Some management actions that help prevent noxious weeds may not be feasible or they may conflict with the purpose and need of the project. See Appendix I for a list of noxious weed prevention measures. Those considered non-feasible are discussed. The estimated effectiveness of each prevention measure is listed.

3.13.4 Environmental Effects

3.13.4.1 Direct and Indirect Effects

Activities such as tilling, drill seeding, grazing, tree thinning and burning activities that remove vegetation and expose soil may further increase potential for introduction and spread of noxious weeds, especially when these activities are implemented within or near existing infestations. New infestations can also result from the introduction of weed seed or plant parts via vehicles and seeding equipment or from contaminated seed used in re-vegetation projects.

Once established, aggressive, non-native plants are often difficult to replace with native species. On some sites, soil disturbance (notably the loss of the soil A horizon) has resulted in sites less capable of returning to native plant communities for several decades or longer. Noxious weeds and other invasive plant species (including some non-native grasses) can out-compete native species on altered sites (Hall 1996).

Environmental effects due to non-native invasive plants can include the following (Olson 1999, USDA/USDI 2000):

- Changes to ecosystems by altering soil properties. Specifically, erosion may increase and organic matter may be reduced, affecting available nitrogen to plant communities. Weeds take up soil nutrients rapidly, further depleting soil nutrient reserves. Weeds can produce compounds that may affect soil microorganisms. These changes cause soil surface and subsurface structure changes, which result in reduced infiltration rates and water-holding capacity of soils.

- Alteration of the composition of plant communities by displacing native plants. This can reduce habitat values for native wildlife species dependent on native plant communities. Such changes can result in a loss of abundance and diversity of wildlife species.
- Alteration of historic disturbance cycles. Medusahead, for example, produces large amounts of fine fuels, reducing fire-return intervals, which can lead to reductions or extirpation of native plants that are not adapted to higher fire frequencies.

Several observational studies (Belsky 2000) indicate that selective grazing by livestock can promote invasive plants. Livestock can spread noxious weeds over a wide range when seeds become attached to hair or when they remain intact after passing through the digestive system (DeClerk 1997, DiTomaso 1997, Miller et.al. 1999 and Zimmerman et al. 2002). Livestock can also be used to control invasive species. During the past 15 years cattle were used to control spotted knapweed within riparian areas on the Grassland (Cheney 2004). Goats have been used to control weed infestations on recent wildfires on the Grassland (Geneva and Eyerly fires 2003).

Alternative A includes no tree thinning, burning, grazing, or other activities that increase the potential for introduction and spread of invasive plants. No project-related disturbance would occur. Compared with other alternatives, Alternative A offers the lowest risk for introduction of noxious weed propagules.

Fine fuels and juniper densities would slowly increase and, in the long-term (over the next few decades), result in the highest potential for larger, more-intense fires that would increase weed risk. However, given the fire history and prognosis for wildfire (Bell 2003), risk of weeds from wildfire is considered to be less than foreseeable future activities such as vehicle use.

The primary way in which mineral material sources are contaminated with noxious weeds is through the introduction of noxious weed propagule contaminated equipment. Weeds spread in the course of equipment working in the material sources, maintaining roads and spread of contaminated rock. There is also the potential for the transport of weed seed into the material sources from adjacent prescribed burning/treatment areas that become infected.

Under Alternatives A and B there would be no treatment units adjacent to mineral sources containing existing noxious weed or other invasive species.

There will be no alteration of the current rate of noxious weed spread into or out of the mineral material sources. There will be continued use of the mineral material sources and maintenance of the roads. These are part of the primary transport mechanism of the seed spread. Treatment of these sites would continue. Project design criteria requiring cleaning of equipment would be enforced.

On untreated areas, juniper densities would slowly increase and result in long-term term (> ten years) higher potential for larger, more-intense fires that would increase the risk of invasive species establishment and spread. However, the risk of noxious weed spread and establishment from wildfire is considered to be less than other foreseeable future activities.

Alternative B continues the existing level of risk associated with livestock grazing. Current grazing standards for forage utilization do not appear to substantially increase risk for introduction and spread of weeds. Soil exposure due to trampling and trailing and noxious weed propagule exposure would be expected to continue at current level. Acres of exposed soil associated with livestock concentrations at watering areas and corrals are estimated to be 2,200 acres.

Alternatives C and D include the following ground-disturbing activities: juniper control treatments, seeding, livestock grazing and burning. Each of these activities presents a risk of the

introduction and spread of invasive plant species. Compared with all alternatives, Alternative C has the highest amount of ground disturbance (14,300 acres). Ground disturbance associated with Alternative D is estimated at 10,500 acres.

Alternatives C and D propose to control juniper. Juniper removal could allow sagebrush and bunchgrasses the opportunity to expand and/or establish. Such establishment generally provides some natural deterrent to invasive species.

Alternatives C and D propose to till and seed an old tall wheatgrass seeding near Mud springs Creek adjacent to Buck Butte. Buck Butte contains a medusahead infestation. There is a risk of the spread of medusahead into the proposed seeding and tillage area. It is believed that this risk is minimal as the proposed seeding would occur on deep loamy soil. Medusahead favors more clayey soils such as those concurrent with the infestation on Buck Butte. The risk of medusahead spread into the proposed seeding is reduced by the good potential for establishment of the seeded species.

The primary way in which mineral material sources are contaminated with noxious weeds is through the introduction of noxious weed propagule contaminated equipment. Weeds spread in the course of equipment working in the material sources, maintaining roads and spread of contaminated rock. Under Alternatives C and D there is also the potential for the transport of weed seed into the material sources from adjacent prescribed burning/treatment areas that become infected

Alternatives C and D contain activities which provide a moderate to high-risk of invasive species establishment and/or spread. However, design criteria are expected to reduce the probability of vegetation management and fuels projects, spreading existing infestations or, bringing new weeds in from outside the planning area, reducing the risk of invasive species establishment and/or spread to moderate to low. The risk of livestock spreading weeds is moderate to high, especially when livestock move from medusahead-infested pastures to un-infested pastures (DeClerk 1997, DiTomaso 1977, Miller et. al. 1999 and Zimmerman et. al. 2002), however, is less than described under Alternative B as the institution of rest higher year end stubbles will necessitate a reduction in the time cattle are on the grassland, thus reducing the time of exposure to potential noxious weed propagule introduction.

3.13.4.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

The exact sources of present infestations are unknown but they are expected to have originated over several areas. Noxious weed infestation mapping shows concentrated sites along primary travel and utility corridors, especially Highway 26. The primary vector for noxious weeds appears to be vehicles. Other infestations are associated with recreation sites, mineral material sites, utility lines and developed trails, indicating introduction by vehicles, horses, hay, and equipment. Other vectors for weed spread include wind and water. Livestock and wildlife can carry seed in their digestive tracts as well as in their coats (Sheley et. al. 1999b).

The Grassland road system serves a variety of human uses. Roads will continue to provide dispersal and establishment sites for noxious weeds. Expanding non-native noxious weed infestations outside the Grassland combined with increasing recreational use will likely increase the potential for new noxious plant infestations.

The cumulative effects of present and reasonably foreseeable activities indicate a high risk for the introduction and spread of noxious weeds. Weeds will continue to be introduced and spread by: vehicles, equipment (such as used for road maintenance and construction activities), the recreating

public (mountain bikers, horseback riders, hikers and campers), dog and horse trial event participants, off-road vehicles, water, wind, livestock, wildlife, and other sources.

Prevention techniques included as design elements for non-project activities, such as requiring clean equipment for utility line maintenance, would help reduce risks associated with other reasonably foreseeable future activities. Equipment cleaning requirements and other provisions are standard as part of permitted actions, such as maintenance of utility lines. The majority of other activities, including recreational driving and illegal off-road vehicle use, are not permitted. However, additional provisions expected in the next one to two years include requiring all livestock feed brought onto the Grassland be certified as noxious weed-free.

Fire suppression can result in the introduction or spread of weeds by fire fighting equipment brought in from different areas that may contain weed seed or plant parts. Due to the emergency nature of wildfire, prevention measures such as equipment cleaning are not always implemented. Dozer lines, hand lines, drop points, safety zones, staging areas, etc., all create bare ground due to heavy traffic. Vehicle traffic, during and after suppression activity, can introduce weed propagules to highly susceptible environments. Fire rehabilitation efforts such as seeding, weed control, erosion control and area closures mitigate many of these risk factors. The potential for major wildfire and the subsequent risk on noxious weed establishment and spread is considered negligible when compared to ongoing and anticipated increased use by the public.

Weed infestations included in the 1998 Integrated Weed Management Plan are expected to be treated each year and would continue to decrease in size. A table of treatment sites is included in the Appendix. The remaining untreated infestations would continue to spread, displacing native and desirable non-native vegetation and reducing biodiversity. Projecting the rate and extent of spread is difficult due to many unknown variables including weather patterns and the timing and influence of decisions related to the current Region 6 EIS process for managing non-native invasive plants.

Cumulative impacts of travel on Grassland roads by visitors will be detrimental to native vegetation through the spread of noxious weeds in the long term. Human use of the Grassland is increasing and is expected to increase in the future as adjacent populations continue to grow. Wet season, illegal off road use and legal road use can be conducive to weed spread due to mud clinging to the tires undercarriage and other portions of a vehicle.

Prevention techniques incorporated into the design elements of the alternatives, and the current weed treatment program are expected to reduce cumulative effects (exposure risk, intensity, magnitude, and duration).

Areas where prescribed burning would take place are expected to re-vegetate quickly and become less susceptible to non-native noxious weeds, especially with low intensity winter/spring burns that are planned with this project. Project design criteria to rest pastures for two years minimum would minimize risk of the introduction and potential for spread of weeds within burned areas.

Wildfire suppression on the Grassland generally avoids construction of fire lines; using instead natural fuel breaks such as ridge tops or human-created fuel breaks, such as roads. This practice reduces the amount of soil disturbance associated with wildfire suppression and prescribed burning projects; therefore, reducing opportunities for weed establishment and spread.

In addition, new weed infestations have been documented in the analysis area on sites that have had relatively little disturbance. There is an inherent risk of new infestations (such as from windblown seed) in all alternatives regardless of other activities.

3.13.5 Noxious weed cost analysis:

The 1995 Noxious Weed Environmental Assessment and Decision Notice, Appendix 3 – Prevention Measures, states the following would be incorporated in project planning:

- Noxious weed risk assessment and management would be a part of all NEPA planning activities where land disturbance or noxious weed introduction or spread could result from that activity. Prevention would be included as the priority strategy for noxious weed management.

A risk assessment has been completed. Prevention measures have been incorporated as project-wide design elements (e.g. no vegetation management activities adjacent to noxious weed infestations).

- NEPA analysis would consider the costs associated with preventing the occurrence or spread of noxious weeds.

A cost analysis for noxious weeds has been completed. Current annual cost of noxious weed control on the National Grassland is approximately $250 per site. With knapweed seed bank viability of up to ten years, overall costs of eradication would be $2,500 per site, assuming no inflation and complete elimination of seed production.

3.13.6 Risk Assessment

Two types of analyses are included in the risk assessment. The first compares the amount of exposed soils for alternatives and the other uses a checklist of risk factor such as burning adjacent to infestations, etc. The risk assessment comparison of disturbed acres only includes direct and indirect effects of the alternatives. The risk factors assessment includes these effects as well as the cumulative effects of recreation use, etc.

3.13.6.1 Soil Disturbance

Proposed prescribed burning and tillage prior to seeding would expose soils, increasing susceptibility to noxious weed introduction and spread. Risk is proportional to the degree of soil disturbance. The Mill Creek Timber Sales EIS weed risk assessment provided the basis for this analysis (USDA Forest Service 1999c). Table 3-70 compares expected soil disturbance, and therefore, weed risk, by alternative.

Table 3-70 Acres of Soil Disturbance by Alternative and Management Activity, CRNG

Activity	Acres of Exposed Soil			
	ALT A	ALT B	ALT C	ALT D
Till/seed/fertilize*	0	0	2,800	2,800
Juniper control and seeding**	0	0	1,700	1,700
Juniper control & prescribed burning**	0	0	8,100	4,200
Livestock grazing***	0	2,200	1,700	1,800
Total Area	0	2,200	14,300	10,500

* Estimated 33 percent of treatment area would be tilled.
** Estimated 20 percent of treatment area exposure.
*** Estimated 2 percent exposure associated with troughs, corrals, and pasture corners.

3.13.6.2 Risk Factor Assessment

A checklist was developed with various activities rated for risk of introducing or spreading weeds. Any high-risk activity results in a high risk ranking for that alternative.

This checklist includes direct, indirect, and cumulative effects. An example of an activity with direct effects would be heavy equipment use such as road grading within infested areas. This activity would likely directly spread weeds. An activity with indirect effects would be burning slash piles adjacent to infestations. Burned sites would be highly susceptible to weed spread.

The checklist also includes the cumulative effects of reasonably foreseeable activities such as off-road vehicle use within weed infestations. Vehicles are expected to continue to introduce and spread noxious weeds. The Deep Timber Sales EIS weed risk assessment provided the basis for this analysis (Mafera 2003). Table 3-71 compares expected soil disturbance, and therefore, weed risk by alternative.

Table 3-71 Noxious Weed/Invasive Plant Risk Factor Assessment Summary, CRNG

	Alt A	Alt B	Alt C	Alt D
Risk of Noxious Weed Introduction/Spread	HIGH	HIGH	HIGH	HIGH

The risk factor assessment indicates high risk for all alternatives, including no action. Vehicle use within infestations is high risk. This risk factor is present in all alternatives.

Action alternatives include livestock movement within or from areas with known infestations. This is also high risk.

The complete risk factor assessment is in the Botany Specialist Report, Appendix B.

3.13.7 Alternative Summary

Risk for introduction and spread of noxious weeds is proportional to the level of exposed soils from burning, etc. The presence of risk factors such as grazing within infestations also determines the level of risk.

Vehicles and equipment have the largest potential to introduce new weed infestations and spread existing ones. This potential exists for activities including drill seeding, tree removal, and burning. Although the project contains high-risk activities, the probability of vegetation management and fuels projects spreading existing infestations or bringing new weeds in from outside the planning area is moderate to low when all prevention and project design criteria are followed.

The comparison of disturbed soils for alternatives indicates Alternative A would result in no soil disturbance from project activities and therefore has the lowest risk of introducing or spreading non-native invasive plants. Alternative C has the highest risk because of the greatest number of acres of soil disturbed by proposed activities (approximately 10,900 acre). Alternative D has the next highest risk with approximately 7,700 acres of soils disturbed by proposed activities. Alternative B has the lowest risk of the three action alternatives with approximately 2,200 acres associated with soil disturbance.

The risk factor assessment indicates that all alternatives still result in high risk for the introduction and establishment of noxious weed species due to continued vehicle use that will likely introduce and spread weeds.

Cumulative impacts from reasonably foreseeable activities, especially vehicle use, appear to be the primary influence for continued high weed risk.

3.13.8 Forest Plan Consistency

There are no LRMP goals, objectives, desired future conditions, or standards and guidelines for noxious weeds.

3.14 Fire and Fuels

3.14.1 Current Management Direction (LRMP, FSM, laws, etc)

3.14.1.1 Standards and Guidelines

Standards and guidelines are management direction specified for each management and resource area by the Grassland LRMP (LRMP, 1989, pages 4-67 through 4-74). Standards and guidelines specific and relevant to this project are listed below:

- Prescribed burns will be conducted within existing Federal and State regulations affecting the timing, duration, and dispersal of emissions.
- Construct water diversions on fire lines in hilly or steep terrain to drain water into areas with sufficient vegetation or other protection to avoid erosion.
- Provide for a protective strip of undisturbed surface between the prescribed burn area and perennial watercourses, considering local topography, vegetation, and soil characteristics.
- Avoid intense prescribed fire on soils that are highly erodible and/or are subject to the development of hydrophobic (nonwettable) conditions.

3.14.1.2 Desired Condition

LRMP objectives for prescribed fire (LRMP, 1989, page 4-7) are to:

- Reduce wildfire intensities to support a cost-efficient fire protection organization.
- Emulate the natural role of fire in maintaining environmental diversity and site productivity, and in maintaining or improving wildlife and range habitat.

The Desired Future Condition (DFC) regarding fire on the Grassland is that:

In ten years:

- The natural role of fire on the Grassland will be emulated by a mix of prescribed fire, natural fire and other management techniques.

In 50 years and beyond:

- "The natural role of fire would continue to be emulated by a fully integrated program of prescribed fire and other management techniques. Increasing values at risk on intermixed private lands will continue to increase the need for fuel hazard management at the interface with Grassland areas …" (LRMP, 1989, page 4-7).

To meet the DFC, treatments would be designed to create and/or maintain certain vegetative conditions and structures. Within the western juniper PAG these conditions would be represented by conditions illustrated by photo series WJ01 and WJ04 (Figures 3-14 and 3-15).

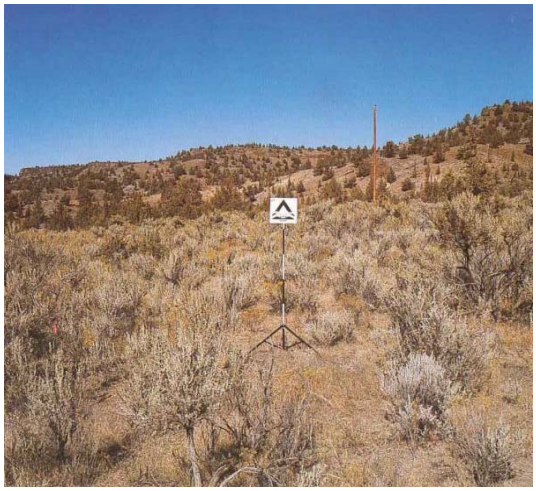
Figure 3-14 Photo Series WJ01

Figure 3-15 Photo Series WJ04

In the ponderosa pine PAG treatments would be used to create and/or maintain conditions illustrated by photo series 7-PP-3 with a mixture of SB01 and SB04 (Figures 3-16 and 3-17).

Figure 3-16 Photo Series 7-PP-3

Figure 3-17 Photo Series SB04



3.14.2 Affected Environment

Fire has been an important disturbance agent for thousands of years. Climatic and cultural changes over the years have affected the distribution of vegetation, fire, ignition, behavior patterns and subsequent ecological effects. Fire has played and will continue to play an important role in the development of the vegetation on the Crooked River National Grassland (Grassland). Currently fuel conditions range from:

- Old growth juniper stands with little to no fuel continuity between trees.
- Areas of brush and grass interspersed with juniper of various ages.
- Areas of pure grass and brush with little or no juniper present.

The western part of the Grassland is a unique area. It contains ponderosa pine stands that transition between the forested areas of the Deschutes National Forest and the high desert environments of central Oregon. A variety of fuel treatment projects have taken place within this area, including timber harvest, timber stand improvement thinning, wildlife habitat improvement thinning, and prescribed fire.

Wildfire occurs when environmental conditions (fuels, weather and topography) are favorable for the spread of fire following an ignition. These conditions together are described as the "Fire Environment."

The most influential weather factor influencing the fire environment is wind. Steepness of slope is the most important topographic feature. Fuel loading and fuel moisture are the important fuel conditions. Fuel moisture changes are based upon weather conditions. Fire intensity and duration are based upon conditions found in the fire environment. Changes in these environmental conditions result in changes to fire intensity, fire effects, and fire suppression effectiveness. Of the three components of the fire environment (fuels, weather, and topography), only fuel loading and arrangement can be changed through management actions.

Wildfire "susceptibility" is defined in terms of risk and hazard. Risk is defined as the probability that an ignition will occur. Hazard identifies the availability of fuels to sustain the fire.

Fire risk on the Grassland is defined as the risk of a human or lightning caused fire occurrence. Lightning does occur on the Grassland and adjacent lands. No management activity can prevent it. Human caused fire occurrence will also continue. No fire prevention program has been 100 percent successful in stopping human caused fires.

If the trend of the last 15 years continues, this project area could expect between six and seven fire starts per year from a combination of lightning and human causes.

Fire hazard can be described in terms of fuel profile. A fuel profile describes the amount (loading), arrangement (surface, ladder, crown fuels), and continuity of fuels through an area. The changes that occur in the loading, arrangement, or continuity of the fuels change the predicted fire behavior and associated fire effects. Changes in the fuel profile change the fire hazard.

3.14.2.1 Wildfire

From 1970 to 2001, the Grassland had 210 wildfires on approximately 8,219 acres. The average number of fires during this period was 6.6 fires per year and averaged a total of approximately 257 acres burned per start. Forty-four percent were lightning caused; the remaining 56 percent were human-caused ignitions. During 1995 there were no fires and no acres burned. The greatest number of fires (28) occurred in 1999, but the greatest number of acres burned (3,350) in 1996.

Fire exclusion has contributed to the spread of Western Juniper outside of its historic range, the result being an increase in fuel loading, which in turn has increased the potential for high intensity and high severity wildfires.

Grassland fuel types have shown the potential for fast moving wildfires. Fire suppression is becoming more complex due to the increase of new homes in the wildland/urban interface, and an increase in summer visitors to recreation sites around the Grassland during fire season.

3.14.2.2 Prescribed Fire

The Grassland has had a varied fire and fuel management history over the past 20 years. Management actions have ranged from large landscape sized prescribed burns that took place during late summer conditions, to low intensity burns during more moist spring and fall conditions. These treatments produced a wide range of results from total kill of juniper and brush to consumption of only the fine fuels (grasses and forbs). These projects, especially the late summer burns, have exposed soils in some areas to invasion by noxious weeds and other invasive plants.

The primary objective of the prescribed fire program has been for juniper reduction. During the period 1991 to 2002, 16,434 acres were treated by prescribed fire. On average, 1,369 acres were

treated each year. The greatest acreage treated was in 1998 (5,210 acres), followed by 1995 when 4,405 acres were treated.

3.14.2.3 Air Quality/Visual Quality

Visual quality impacts are experienced during fire events, both planned (prescribed fire) and unplanned. The majority of the smoke is best characterized as white fine fuel smoke that dissipates quickly with periods of dark brown to black smoke when sagebrush and juniper trees are being consumed. Normally, the impact is short term (a few minutes or hours) due to the fuel types on the Grassland. Little residual smoke is encountered the day after a fire or prescribed burn takes place. Fuel types associated with the Grassland are typically consumed quickly or cease to burn after sundown due to higher relative humidity and lower air temperatures.

3.14.2.4 Fire Regimes

There are three fire regimes common to the Grassland: non-lethal, very frequent fire regime (NL-VF); mixed frequent fire regime (M-F); and stand replacement frequent fire regime (SR-F).

The NL-VF fire regime is common to the E1g seral/structural stage. This regime is characterized as a low intensity (flame lengths < 2 feet) ground fire burning primarily in grass and low lying brush. The mixed frequent (M-F) fire regime is common to the mid seral/structural stage E1s, M2, and M3. It is characterized as a moderate intensity fire (flame lengths 3-4 feet) ground fire moving into the tree canopies with some isolated torching events. Short range spotting, 0.1-0.2 miles, may occur.

The SR-F fire regime is common also to the E1s and M2 seral/structural stages. This regime is characterized as a fire that displays sustained crowning events (flame lengths > 8 feet) with long range spotting. This type of fire was rare until recently. It has become more common in recent years with more intense fires on a more regular basis.

Table 3-72 (below) shows the historic and existing quantity of the different seral/structural stages on the Grassland.

Table 3-72 Historic and Existing Quantity of the Seral/Structural Stages on the Grassland.

PAG	S/S Stage	Existing Condition		Historic Percentage		Historic Acres	
		Acres	% PAG	Low %	High %	Low Acres	High Acres
Western Juniper	E1g	20325	18	15	21	15189	21264
	E1s	37104	33	35	49	35441	49617
	M2	30640	28	0	10	0	10126
	M3	18903	17	5	10	5063	10126
	L4a	593	1	0	0	0	0
	L4b	3217	3	15	30	15189	30378
	L5a	0	0	0	0	0	0
	L5b	0	0	5	12	5063	12151

Fuel conditions are characterized by fuel types, which in turn are characterized by different photo series that illustrate different species group, and conditions within each group. Two fuel types, western juniper and ponderosa pine, are present on the Grassland. These types are further separated by photo series that displays the different fuel conditions within the type.

The western juniper type is described by the WJ 03/04 photo series. This series is used to illustrate fuel conditions across the Grassland where the western juniper plant association is present. This series is characterized by tree stocking levels ranging from 195 to 441 stems per acre with a total crown mass ranging from approximately 0.8 to 3.8 tons (1,592 to 7,541 pounds) per acre.

The ponderosa pine type is described by three photo series; 1-PP-3, 2-PP-3 and 3-PP-3. Tree stocking levels range from 12 to 180 trees per acre and total crown mass ranging from approximately 1.6 to 8.3 tons per acre. The pine type is located only west of the Deschutes River (Bell 2004).

3.14.2.5 Data Sources

The Viable Ecosystem Management Guide (VEMG) (USDA 1994) was used to determine the vegetation historical range of variability (HRV). Existing satellite imagery and aerial photography were used to determine existing vegetative conditions on the Grassland. A spreadsheet program was then used to compare existing vegetative conditions against HRV developed through VEMG. This analysis determined that there is an excess amount of M3 (5 – 9 inch diameter juniper dominated vegetation) across the Grassland and associated watersheds when compared to HRV. It also determined a consistent deficiency of stages L4b (9 – 20 inch diameter juniper) and L5b (>20 inch diameter juniper). Most watersheds and the Grassland are also deficient in E1g, grass stage.

Differences between existing conditions and HRV were used to identify opportunities for treatments that would bring or begin to bring existing conditions into alignment with HRV. A more complete discussion of VEMG and HRV can be found at the beginning of this chapter (Section 3.1).

3.14.3 Environmental Effects

3.14.3.1 Direct and Indirect Effects

3.14.3.1.1 Alternative A – No Action, and Alternative B – Current Management

Livestock grazing on public lands has a limited measurable effect on wildfire risk and hazard. Livestock consume fine fuels, which reduces fuel loadings, and break up the continuity of the fuel bed. This reduces fire hazard. Cessation of grazing would result in a buildup of fine fuels and, over time, an increase in fire spread rates. Alternative A would result in an increased probability of an unplanned ignition becoming a large fire.

Under Alternative A the risk of a catastrophic wildfire would remain the same or increase because fine fuel loadings would remain high throughout the fire season. This combined with additional vegetation (brush/shrubs) would change the overall fuel profile.

Under Alternative B, this risk would be reduced as fine fuels would be consumed by livestock, reducing ground fire spread rates.

In areas where juniper has increased in density and formed woodlands, over time, rates of ground fire spread could decrease due to the lack of under story vegetation. The potential risk of crown fires would remain static or increase during times of extremely dry and hot weather. Resistance to control would also increase as the probability of aerial burning (as opposed to burning in ground fuels) increases. The risk of long-range spotting would remain high. Unplanned ignitions could be more difficult to control.

Neither alternative would have an effect on visual quality or human health associated with prescribed fire. No prescribed fire would be implemented under either Alternatives A or B. There would be effects on visual quality and human health should a wildfire (lightning or human caused) ignite under either alternative.

Air quality would be affected by wildfire. National Ambient Air Quality Standards include standards for total suspended particulates (solid material contained in smoke). PM10 is particulate

matter that measures 10 micrometers in diameter or less. PM2.5 is particulate matter that measures 2.5 micrometers or less. CO is carbon monoxide.

Tables 3-73 and 3-74 display projected emissions associated with a fire burning in two representative fuel types on the Grassland. These tables display the effects that would be expected to occur should a wildfire ignition occur under the specified conditions. In the long-term the difference between Alternative A and B would be slight (the difference being based upon the effects of grazing on fine fuels) because there are no vegetation management activities proposed that would reduce fuel loadings associated with juniper expansion. Some fuel reductions would occur associated with grazing, but they would be limited and likely not measurable because livestock would remove primarily fine fuels rather than larger materials.

Table 3-73 illustrates emissions measured in pounds per acre associated with fuel loadings of approximately 0.53 tons per acre. Approximately 34 percent of the Grassland acreage is in this fuel class. It should be noted that the fuel loading figures are at the low end of the scale; higher fuel loadings would result in larger numbers.

Table 3-73 Potential Emissions (lbs per acre) by Moisture Condition and Season, Low Fuel Loading (0.53 tons/acre), CRNG

Emission Type	Fire Type		Total
	Flaming	Smoldering	
Very Dry – Late Summer			
PM 10	1	10	11
PM 2.5	1	8	9
CO	3	109	112
CO2	775	446	1221
Dry – Late Spring/Summer			
PM 10	1	9	10
PM 2.5	1	8	9
CO	3	104	107
CO2	775	421	1196
Moderate – Spring/Fall			
PM 10	1	9	10
PM 2.5	1	8	9
CO	3	101	104
CO2	775	410	1185
Wet - Winter			
PM 10	1	9	10
PM 2.5	1	7	8
CO	3	96	99
CO2	775	392	1167

Table 3-74 illustrates emissions measured in pounds per acre associated with fuel loadings of approximately 11.55 tons per acre. This fuel loading characterizes approximately 60 percent of the Grassland acreage. Again, the numbers shown are at the lower end of the fuel loading scale.

Table 3-74 Potential Emissions (lbs per acre) by Moisture Condition and Season, High Fuel Loading (11.55 tons/Acre), CRNG

Emission Type	Fire Type		Total
	Flaming	Smoldering	
Very Dry – Late Summer			
PM 10	1	278	279
PM 2.5	1	236	237
CO	3	3144	3147
CO2	815	12796	13611
Dry – Late Spring/Summer			
PM 10	1	218	219
PM 2.5	1	185	186
CO	3	2466	2469
CO2	832	10037	10869
Moderate – Spring/Fall			
PM 10	1	175	176
PM 2.5	1	149	150
CO	3	1981	1984
CO2	849	8062	8911
Wet - Winter			
PM 10	1	47	48
PM 2.5	1	40	41
CO	3	527	530
CO2	787	2144	2931

3.14.3.1.2 Alternatives C and D

Alternatives C and D propose to continue grazing which reduces fine fuel buildup and wildland fire growth. Alternative D would result in slightly less reduction than Alternative C which would be less than under Alternative B (due to the fewer acres being grazed). Alternatives C and D propose approximately 50,000 and 30,000 acres of juniper density control respectively. These actions would notably reduce fuel loading and, therefore, future fire spread. A short-term effect associated with juniper density control, as proposed, would be the fuel generated by chainsaw cutting. This risk would diminish over time as the fuels "melt" into the ground (decompose and incorporate with the soil).

In addition to the effects of grazing and juniper control discussed in the section above, the following effects are also expected under Alternatives C and D:

Air Quality

The use of prescribed fire could have effects on both visual quality and human health under both alternatives. Locally, smoke could impact communities and visitors to the Grassland during times of ignition. Based on past experience and prevailing wind patterns this would be expected to occur for a short duration, normally less then 1 hour. Broad scale visual effects to air sheds should also be minimal due to the fact that the fuel types found on the Grassland typically produce short term smoke events that normally last less then a few hours. In combination with the prevailing wind patterns which disperse smoke, air quality impacts would be expected to be short term and infrequent.

Emissions from smoke result in the release of particulates into the atmosphere. These have the potential to affect the health of forest workers, visitors, and local residents of Jefferson, Crook, and Deschutes Counties. According to Clean Air Act of 1977 and as amended in 1990, Federal land

managers will attempt to, "*protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare*".

The Oregon Department of Environmental Quality is responsible for assuring compliance with the Clean Air Act. In 1994, the U.S. Forest Service, in cooperation with the Oregon Department of Environmental Quality, the Oregon Department of Forestry and the Bureau of Land Management, signed a Memorandum of Understanding (MOU) to establish a framework for implementing an air quality program in Northeast Oregon. The MOU includes a prescribed fire emission limit of 15,000 tons of PM 10 per year for the national forests of the Blue Mountains (Malheur, Ochoco, Umatilla, and Wallowa-Whitman). (PM 10 are particulate matter that measure 10 microns in diameter or less, and are small enough to enter the human respiratory system.) All prescribed burning on these forests (including the Grassland) is coordinated with the Oregon State Department of Environmental Quality and the Oregon Department of Forestry thru the State of Oregon smoke management program.

Table 3-75 displays expected reductions in fuel loading by season and moisture condition for the two fuel loadings representative of the Grassland. Most burning would take place during moderate burning conditions (higher fuel moistures, lower air temperatures). By burning during these conditions, less fuel would be consumed, and the impact to air quality would be reduced.

Alternative D would affect air quality less than Alternative C, because of fewer acres treated. It would also result in a smaller reduction in fuel loading than Alternative C.

Table 3-75 Prescribed Burn Fuel Consumption by Moisture Condition, Season, and Fuel Loading

Season	Fuel Consumed	Post-Burn Fuel Loading	% Reduction
Fuel Loading 0.53 tons/acre Prior to Prescribed Burn			
Very Dry - Late Summer	0.40	0.13	75
Dry - Late Spring/Summer	0.39	0.14	74
Moderate – Spring/Fall	0.38	0.15	73
Wet - Winter	0.37	0.14	72
Fuel Loading 11.55 tons/acre Prior to Prescribed Burn			
Very Dry - Late Summer	8.04	3.51	70
Dry - Late Spring/Summer	6.49	5.06	56
Moderate – Spring/Fall	5.31	6.24	46
Wet - Winter	1.72	9.83	15

Approximately 13,194 acres would have prescribed fire applied under Alternative C and approximately 10,441 acres under Alternative D. Table 3-76 displays soil temperatures for various depths depending upon fuel load, season of burn, moisture conditions and duration of the fire. Prescribed burns would be conducted under as cool and moist conditions as possible. Prescribed fire treatments would be conducted under the State of Oregon Smoke Management System to track smoke produced and would be coordinated with adjacent National Forests to meet smoke management objectives for total emissions.

Prescribed fire would be conducted under favorable smoke dispersal conditions, avoiding impacts to Class I areas and designated urban areas. The closest Class 1 area is the Jefferson Wilderness, 20 miles to the west (into the prevailing wind). The closest designated urban area is Bend, 30 miles to the south. Inversion conditions which would increase the potential for smoke pooling in valleys and drainages would be avoided during prescribed fire operations.

Table 3-76 Soil Temperatures by Fuel Loading, Fire Duration, and Fire Temperature

High End Fuel Loading														
Depth														
	Centimeters	0	1	2	3	4	5	6	7	8	9	10	11	12
	Inches	0	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.1	3.5	3.9	4.3	4.7
Very Dry	*Late Summer*													
	Celsius	231	193	161	134	112	94	80	70	63	56	48	39	30
	Fahrenheit	3978	3324	2773	2308	1929	1619	1378	1206	1085	964	827	672	517
Dry	*Late Spring/Summer*													
	Celsius	137	112	92	77	67	61	55	50	45	40	36	31	26
	Fahrenheit	2359	1929	1584	1326	1154	1051	947	861	775	689	620	534	448
Moderate	*Spring/Fall*													
	Celsius	37	32	30	29	28	27	26	25	24	24	23	22	21
	Fahrenheit	637	551	517	499	482	465	448	431	413	413	396	379	362
Wet	*Winter*													
	Celsius	18	20	20	20	20	20	20	20	20	21	21	21	21
	Fahrenheit	310	344	344	344	344	344	344	344	344	362	362	362	362

Table 3-77 summarizes the number of acres that would be treated by prescribed fire either by itself or in conjunction with other methods. Alternatives A and B would not implement any prescribed burning. Alternative C would implement the most, with approximately 13,194 acres to be treated over the next ten years. Alternative D would implement approximately 10,441 acres of prescribed fire treatment over the next ten years.

Table 3-77 Alternative Comparison Summary: Acres of Prescribed Fire by Alternative.

TREATMENTS with Prescribed Fire	**Alternatives**			
	Alt A	**Alt B**	**Alt C**	**Alt D**
Acres of Juniper Density Control - Chainsaw/Prescribed Fire	0	0	5,196	5,196
Acres of Sagebrush/Juniper Control - Prescribed Fire	0	0	7,510	4,757
Total Treatment acres using Prescribed Fire	0	0	12,706	9,953

3.14.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

The cumulative effect of fire exclusion, agricultural development, urban expansion, grazing, etc. have dramatically changed the structure of the plant communities of the Grassland. Juniper woodlands have expanded, with western juniper out-competing other vegetation.

Near or on the Grassland the following projects/activities will contribute to cumulative local affects.

- **Grizzly Juniper treatment project** located on the Grassland near Grizzly Mountain is designed to chainsaw fell encroaching juniper from sagebrush steppe plant associations.

Approximately 3,000 acres of juniper/sagebrush will be converted to mostly sagebrush through this project.

- **Suppression of wildfire** on the Grassland will continue as urban interface zones; surround the Grassland, and demand fire suppression to protect homes and businesses. Specific projects that will have an effect on WUI areas include: Round Butte Estates, Crooked River Ranch, Hwy 26, and Juniper Butte (formerly known as Jeffco Fuels). The suppression of wildfire will continue to change the structure of the adjacent stands; fine fuels (grasses and shrubs) will replace the brush and juniper that currently occupies these areas. Over the past twenty years this activity has averaged 2,500 acres per year.

- **Planned and future fuel reduction projects** for the Grassland will also contribute to the maintenance or increase of fine fuel levels, as juniper is reduced in density and shrub canopies are manipulated through: prescribed fire, chainsaw cutting, or shrub mowing. It is estimated that treatment acres are between 0 and 2,000 acres annually. These acres may be the same as some of those proposed in Alternatives C and D.

- **The Central Oregon Wildfire School (COWS)** will continue to occur on the Grassland. This activity will also aid in the maintenance of grass and shrub communities as the school uses practice fires that may reduce juniper density for training purposes. These fires usually constitute less than 10-20 acres annually.

The proposed treatment projects described in Alternatives C and D, in combination with the actions described above, will be expected to generally change the overall structure of the plant communities on the Grassland. Together, these activities will reduce the acreage of juniper woodland and increase the acreage of grasses and sagebrush on the Grassland.

No other reasonably foreseeable future actions (see Appendix Y) will have any cumulative or incremental effect on fire and fuels.

3.14.4 Forest Plan Consistency

The majority of fuel treatment projects will take place outside of management areas that restrict prescribed fire use (MA-11 Haystack Reservoir, MA-14 Dispersed Recreation and MA-15 Gray Butte Electronic Site). Prescribed fire is allowed in the remainder of the management areas as a means of: maintaining naturalness, providing scenic diversity, managing vegetation to reduce fuel loadings, and improving wildlife habitat.

All Forest Plan standards and guidelines will be met for prescribed burning by utilizing the PDCs recommended in Chapter 2 (Section 2.5.2).

3.15 Economic and Social

3.15.1 Current Management Direction (LRMP, FSM, etc.)

3.15.1.1 Goal

- Manage the Grassland to lend support to the social and economic viability of local communities, as well as to the Nation as a whole.

3.15.1.2 Objective

- The Grassland will continue to generate receipts primarily from grazing fees, special use permit fees, firewood sales, and mineral leases.

3.15.1 3 Standards and Guidelines

- Minimize social, cultural, and administrative barriers to legitimate uses of the Grassland

3.15.2 Affected Environment

3.15.2.1 Demographics

The Grassland is located entirely in Jefferson County. The population as of 2002 was 19,850 residents. The County has been the fifth fastest growing county in the State. Since 1970 the population has increased 122 percent, with 40 percent of that increase coming since 1990. Of the 19,850 county residents, approximately 5,300 people live in Madras, the County seat (U.S Department of Commerce 2001). The other major population areas include Culver, Warm Springs, Metolius, and Crooked River Ranch.

Madras and Jefferson County have Central Oregon's most culturally diverse population. Native Americans comprise 16 percent and Hispanics 18 percent of the area's overall residents. Crook and Deschutes Counties' minority populations are 7 percent and 5 percent respectively. Oregon as a whole consists of a 15 percent minority population (U.S Department of Commerce 2001).

The education attainment level in all of Central Oregon, except for Deschutes County, is lower than the rest of Oregon as a whole. The percentage of the County's population having graduated from high school is 47 percent in Crook, 56 percent in Deschutes and 44 percent in Jefferson. For Oregon as a whole, the graduation rate is 53 percent (U.S Department of Commerce, Bureau of Census, 2001).

3.15.2.2 Economy

Out of a total of 5,900 wage and salary jobs in Jefferson County, 1,090 (19 percent) are in wood processing, an additional 2,200 (37 percent) and 1,540 (26 percent) are in government and non-wood product manufacturing respectively. There are also approximately 1500 people who are self-employed, many of who work in the ranching and agricultural sectors (Oregon Employment Department, 2004). Unemployment for 2002 was 6.3 percent, which is higher than both the State and the National averages. The average annual payroll per employee in 2000 was $25,273. This is less than earnings in the 1970s when adjusted for inflation. Per capita personal income and average income from wages has also been declining. Although the income in Jefferson County is traditionally lower than Oregon's average, there has been a widening of the gap mainly due to the loss of relatively high paying jobs in the lumber and wood products industries (U.S Department of Commerce, Bureau of Economic Analysis 2001).

In addition to the big three (wood products, other manufacturing, and government), service industries comprise the fastest growing economic sector within the county. This is also true with most surrounding counties. In Jefferson County the service sector have nearly doubled since 1990 and now represents 23 percent of the total employment within the county. Non-payroll income (rent, interest, dividends, retirement, insurance, welfare, and unemployment) has doubled since 1990 and represents 42 percent of all personal income in the county (U.S. Department of Commerce, Bureau of Census, County Business Patterns, 2001).

Employment and income statistical references do not specifically track recreation and tourism as an economic sector. Instead recreation and tourism contribute to several sectors, transportation, services (accommodations, dining), retail trade, and even government. The Oregon Tourism Commission (2001) estimated total travel related spending in each County. Estimates for 1999 were:

- 20.4 million in total travel spending in Crook County.
- 414 million in Deschutes County.
- 52.9 million in Jefferson County.

Estimated employment from these expenditures in industries supporting recreation and tourism are as follows:

- In Crook County, 380 people, representing 6.3 percent of all wage and salary employment in the county.
- In Deschutes County, 5,160 people, representing 10.5 per cent of salary employment in the county.
- In Jefferson County, 1,040 people, representing 16.8 percent of all wage and salary employment in the county.

Jefferson County is the home of the Warm Springs Indian Reservation, a coalition of the Warm Springs, Wasco, and Paiute tribes. There are approximately 4,000 tribal members, most of who live in or around the town of Warm Springs. Within the tribal community, the Tribal government provides a variety of services, including education, public safety, utilities, health, resource management, business development, and recreation. Many services not offered by the Tribal government are provided by locally owned private businesses or State agencies. The tribal economy is based primarily on natural resources, including hydropower, forest products and ranching. In addition, the Tribes are the owner/operative of a major destination resort and gaming casino.

There are a number of important considerations that distinguish Jefferson County's economy and help moderate economic downturns. The first is that although its manufacturing base is highly dependent on the wood products sectors it is by far more diversified than Crook County's because Jefferson County is home to a major agricultural manufacturer and a large boat builder. The County's; low land and labor cost, relative closeness to Portland, and excellent highway connections and rail service, should all facilitate continued expansion in its manufacturing sectors. Secondarily, Madras is located at the junction of Highway 26 and 97. These are major travel routes. Highway 97 provides access to the year round recreation and population center of Bend as well as to Lake Billy Chinook. Highway 26 provides access to Kah-Nee-Tah Resort and Convention Center and to Portland on the Westside of the state. These primary travel routes allow the county's service and trade sectors to function somewhat independently of its other economic sectors. In the other counties in the state, their service sectors are far more dependent on the health of other major economic sectors including manufacturing, government and agricultural. The third major factor is the size and diversity of the county's agricultural sector. Not only is this sector far larger than it is in the surrounding counties; it is also less dependent on ranching and haying than in surrounding counties (Oregon Employment Department 2001).

Unlike the economy in the other counties, Jefferson's economy was as not severely affected by the recession in the early 1980s. In fact the county actually experienced a population gain of over 600 during this period while the other counties were all experiencing a population loss. In the later part of the decade (1980s), Jefferson County's economy experienced dramatic growth, especially in its manufacturing, trade and service sectors. In 1992, unemployment rates did increase to 10.2 percent, but this rate was far lower than the other three counties, and even below what was registered statewide (11.2 percent).

3.15.2.3 Ranching and Farming

Jefferson County is the ranching center for the tri-county area of Crook, Deschutes, and Jefferson Counties. Crook County is also heavily oriented toward agriculture, but livestock marketing and most of the agricultural services for the tri-county area, are located in Jefferson County. Although farm employment is only about a third of what it was in 1970, it remains an important contributor to the local and surrounding communities' economies.

Statewide in Oregon there are 1,360,000 cattle. In 2002 livestock sales comprised 13 percent of all agricultural sales. Livestock sales statewide in 2002 were $422,986,000. In Oregon, livestock sales are second only to greenhouse and nursery production as leaders in state agricultural production (Oregon Department of Agriculture website).

Agricultural crop sales in Jefferson County for 2003 totaled $43,337,000. Livestock sales were 27 percent or $11,283,000 of that total (Oregon State University, 2003). Oregon State University Extension Service estimates that Jefferson County is home to approximately 11,000 cattle. Approximately 2,500 of these cattle graze on the Grassland. Grass and legume seed sales (16 percent) are second to that of livestock. Many of the same livestock grazing permittees using the Grassland also produce grass and legume seed.

3.15.2.4 Social Setting

A community's surrounding physical and biological environments influences the human social life within that community. This is most evident in rural areas where the variety and quality of available natural resources often determines the chief means of economic livelihood and what leisure activities people are likely to pursue. Therefore, these factors will influence local preferences for the use of public lands. From a historic prospective, it is evident that all of the local community's cultures were natural resource based and, to a certain degree, especially in the more rural, less populated areas, still are. Livestock, farming, and timber were the backbone of the economic structure and as a result strongly shaped the social fabric that still defines the communities today. Social factors important to Central Oregon, and specifically to forest and rangeland management as a source of local income include: the region's rural setting and its history of farming and ranching; the manner in which the local population utilizes resources for recreation; the collection of wood for fuel, fish and game for sport, and the effect of an increasing population on the region's job market and economy. Since Federal agencies, mainly the Ochoco and Deschutes National Forests, the Crooked River National Grassland, and the Prineville District of the Bureau of Land Management administer much of the surrounding land, changes in Federal land use policies can impact the socioeconomic and socio-cultural way of life.

One needs to keep in mind that the various communities and the individuals within them contain a broad spectrum of perceptions and values related to uses of resources on the surrounding public lands. These same communities and individuals also have interests that span multiple geographic and political scales simultaneously. Many of the communities are closely tied to the Forests and Grassland in work, subsistence, and play and are directly affected by what happens on the forests and grassland. The relationship between the Forests and Grassland and these communities is based in part on: logs for their harvesting, manufacturing, and transportation businesses; and catering to

recreationists and tourists drawn to the area. People from these communities also use fuelwood, fish, special forest products, and game for part of their subsistence and/or recreational activities. Recreation (often roaded and/or motorized) is also an important component of the life styles for many of the people living in these communities. This is an important consideration because to one degree or another all the local communities express traditional rural culture. Two of the important expressions of traditional rural culture that directly relate to ecosystem management are; the value of working closely with nature and viewing people not as defilers of nature but instead as moral agents for utilizing and protecting the land. Many rural people have come to see themselves as the "true environmentalists" who meet society's need for products from the forest and grassland ecosystems while also giving back to the land by perpetuating its productive capacity (USDA 1994).

Communities such as Prineville and Madras, from a historic perspective, fit the community described above. But with their exploding populations and diversifying economies, they are developing a more diverse set of interests. With the recent weakening of the economy, it is clear that these communities are still very much tied to the wood product industries both economically and culturally. Other communities within the area (e.g. Culver, Warm Springs and Metolius) can generally be defined as ranching or farming communities. These communities generally have no manufacturing based industries and have small, un-diversified economies. The people who reside in these communities also use fuelwood, fish, and game for part of their subsistence and/or recreational activities.

The one over-riding demographic trend in the area is that of rapid population increase through emigration. With influx of retirees and professionals from many specialty areas, Central Oregon is experiencing rapid economic and social change.

3.15.3 Environmental Effects

3.15.3.1 Direct/Indirect Effects

3.15.3.1.1 Economic Viability of Operations

Over 90 percent of the animals that currently graze on the Grassland are mother or breeding beef cattle. They are part the ranching and farming economic base of the area. They produce the calves, which are sold to be "fed out" to ultimately produce consumer beef, thereby providing a foundation for the beef industry. They are part of the basis of stability for the local industry. Livestock sales in Jefferson County are 27 percent ($11,283,000) of the agricultural crop sales, by far the single largest agricultural commodity in the county.

Changing the authorized level of use could affect the economic viability of the permittees' operations depending on the minimum number of Animal Months (AMs) necessary for the permittees to remain in business. The magnitude of effects would depend entirely upon several factors including:

- Options available to each permittee.
- The size of their total operations.
- Debt structure.
- Access to and availability of private land for grazing.
- Availability and costs of replacement forage.
- Business goals and objectives.
- The market for cattle.

Changing the number of permitted AMs would affect the associated ranches' capacity as associated grazing on the Grassland provide up to 50 percent of the ranches' forage needs.

Table 3-78 (below) shows annual permitted animal unit months by alternative. Assuming a direct relationship between herd size and total sales, the percentage decreases in animal unit months noted for each alternative provides estimates of changes in potential gross sales.

Under Alternative A (No Grazing), grazing would be eliminated on all of the Grassland allotments. Alternative B represents a continuation of grazing under existing management direction. As compared to Alternative B, under Alternative A approximately 20 percent of the Jefferson County cowherd could be lost. Whether or not the permittees would continue to maintain their business in a reduced form or supplement the forage loss through other means would depend entirely upon other factors. The permittees may choose a number of different options to provide forage for displaced from Grassland grazing allotments. They may choose to:

- Graze on their own properties if the operations have enough land.
- Find other private land at a fee.
- Use alternative sources of feeding.
- Sell the cattle to avoid the additional costs of keeping their full herd.

Eliminating cattle from the allotments could affect the economic viability of the livestock operations. This is because of additional costs associated with, securing additional range or buying supplemental feed, to accommodate herd sizes consistent with current permitted numbers. Additional costs could include the possibility of additional fencing and establishment of water on newly acquired range, along with increased trucking costs, and labor costs associated with moving and otherwise handling cattle.

In Jefferson County, available pasture for grazing use is limited. In neighboring Crook County buying additional pasture use can cost up to $15 per AM (Fessler 2003). The amount charged for an AM on public lands is $1.43 (2004). Along with additional forage costs, there may be added costs related to transporting cattle to various locations, hiring additional employees, or other administrative costs that may occur as a result of changing established grazing routines.

Alternatives C and D would reduce permitted animal months by approximately seven and three percent respectively. This should not affect the current economic viability of the permittees operations because retiring grazing allotments that are not currently being utilized reflects the reductions in permitted use. Alternative B would maintain permitted AMs at currently used levels.

Table 3-78 Change from Current Management

	Alterantive A	Alterantive B	Alternative C	Alternative D
AUMs Lost	21,714	0	1,4215	731
Precent Change	-100%	0 %	- 7 %	- 3 %

3.15.3.1.2 Job and Personal Income

Grazing reductions would affect employment and income in three ways:

- **Direct** effects attributable to employment associated with the ranches.
- **Indirect** effects attributable to industries that supply materials, equipment, and services to the ranches.
- **Induced** effects attributable to personal spending by the ranch owners, employees, families, and related industries.

Employment and personal income impacts were derived from estimates predicted for the Ochoco National Forest and Crooked River National Grassland area-of-influence (LRMP 1989). Personal income effects have been adjusted to 2004 dollars.

Table 3-79 shows the annual estimated income impacts by alternative. Job totals shown in the table should be interpreted as regional impacts to the general area of influence and not necessarily the expected impact on any one county. However, since Jefferson County does provide much of the agricultural services for the area, these estimates may indeed reflect the influence within the county. In addition, these estimates are for grazing related activities only; they do not include the employment and income effects of the alternatives with respect to restoration projects or other activities. Even with complete cessation of grazing on the Grassland under Alternative A there is relatively little change in employment levels. This small change is because the ranching industry does not require substantial labor inputs to produce a product unit (one cow).

Table 3-79 Annual Employment and Income, Impacts by Alternative, AUMs Basis

	Alt. A	Alt. B	Alt. C	Alt. D
AUM*0.25/1000 AUMs	0.00	5.5	5.1	5.3
Income =AUM*3,646/1000 AUMs	0.00	$79,430	$74,220	$76,760

Changes in jobs and personal income would result in changes in the economic activity of the communities where the permittees; base their operations, hire employees and buy equipment, supplies and services. Under all alternatives, corresponding job and income effects would be attributable primarily to Jefferson County and since most of the ranching industry is located in the county, this job estimate is likely very conservative.

In addition to the employment and income figures from livestock grazing, the vegetation treatments will also generate jobs and income. While no estimate of jobs and income from these activities has been made, it is safe to say that the lack of vegetation treatments in Alternatives A and B will result in no increase in jobs or income, whereas Alternative C's $2.1 million investment over the next ten years will generate both jobs and income and Alternative D's $1.4 million investment will also create both jobs and personal income. Table 3-80 displays the estimated cost for the proposed vegetation treatments under Alternatives C and D.

Table 3-80 Estimated Cost for Vegetation Treatments for Alternatives C and D

Vegetation Treatment	$/acre	Alt. C Acres	Alternative C Cost per Treatment	Alt. D Acres	Alternative D Cost per Treatment
Chainsaw cutting of juniper	45	27,095	$1,219,275	10,803	$486,135
Chainsaw cutting juniper, 2-3 yr. Low intensity burn	54	5,196	$280,584	5,196	$280,584
Tilling/seeding (native)/fertilization/cut juniper	220	8,344	$917,730	8,344	$917,730
Tilling/seeding (cultivar-native)/fertilization/cut juniper (same acreage as above)	120	8,344	$500,580	8,344	$500,580
Mechanical treatment of shrubs and juniper	105	488	$51,240	488	$51,240
Prescribed fire to manipulate shrub canopy	9	7,510	$63,835	4,757	$40,435
Total		**48,633**	**$2,130,698**	**29,588**	**$1,356,517**

3.15.3.1.3 Payments to Counties

By law 25 percent of the revenues collected by the Grassland from the use of Grassland administered lands and resources are returned, ultimately to the county, as a source of funds for schools and roads.

Table 3-81 shows annual revenue from grazing fees for the ten-year period and 25 percent fund contributions, by alternative. Total fees are based on grazing fees of $1.43 per head month for cattle. No payments to counties would be made from fees associated with domestic livestock grazing under Alternative A. Again this value is based on permitted numbers, actual use has normally been far less, and therefore, revenue to the County has also been less than the values displayed in the table.

Table 3-81 Annual Value Permitted Grazing, 25 Percent Fund

Alternative A	Alternative B	Alternative C	Alternative D
$0	$31,000	$29,000	30,000

3.15.3.1.4 Social Impacts

3.15.3.1.4.1 Life-styles

The Social-Economic Overview of the Ochoco National Forest and Crooked River National Grassland lists six "life-style" categories into which many of Jefferson County's and the surrounding county's residents fall. These categories are: Native Americans, ranchers, loggers, mill workers, small-town merchants, and government employees.

Many of the life-styles represented in the area may be affected by implementing the Alternatives. Ranchers depend directly on the Grassland and other federally administered lands for jobs and forage. Significant numbers of public service employees' jobs are related to the management of these federal lands, and local merchants depend on the economic well being of all groups. County residents also use the Grassland for leisure activities. Such activities as firewood gathering, hunting, fishing, hiking, and motorized use; are popular. Native American's also rely on the Grassland for traditional uses such as plant and root gathering, fishing and hunting.

Although the County has a substantial number of people whose activities fall within the ranching life-style category, the ranching industry does not require substantial labor inputs to a unit of produce outputs (a single cow). In addition, the ranching industry is not tied as directly to Federal lands as is the wood products industry. As a result, the elimination of livestock grazing under Alterative A will not have a major impact on the number of people making a living from ranching. Under Alternatives B, C, and D, although there are differences in permitted numbers, actual use is expected to be relatively similar to the recent past, as a result all three alternatives will help maintain the existing ranching industry and the people who make a living from it.

Small town merchants in the county are dependent on the overall health of the local economy. Under Alternative A there is the potential for a slight reduction in jobs and input needs in the ranching industries, and lower revenues for the County (through the Payments to County program), because of the elimination of livestock grazing on the Grassland. The continuation of livestock grazing in Alternatives B, C, and D will help maintain the existing economic makeup of the County. In addition, the restoration projects included in Alternatives C and D will also generate economic activity, which in turn will benefit local merchants.

Native Americans have been using the Grassland for centuries. They have gathered native plants and roots for religious and traditional purposes and have hunted and fished in this area. It is expected that the grazing systems in Alternatives C and D will result in improving ecological conditions. This in turn will result in increased opportunities to engage in these traditional activities. The restoration projects (prescribed fire, tilling and seeding, chainsaw cutting of juniper, and altered grazing systems) planned in Alternatives C and D create a short-term risk for spread of invasive plants (especially under Alternative C). However, as with the expected changes from the modified grazing systems, ecological condition should improve, enhancing the opportunity for traditional activities. Under Alternative A there should be a short-term improvement in ecological

conditions as there will be no grazing pressure. However, in the absence of restoration activities juniper distribution and density will continue to increase over time. As this occurs ecological conditions will decline, reducing the opportunities for Native Americans to partake in their traditional activities. Alternative B continues the existing grazing systems. Although there are safeguards in place, ecological conditions are expected to improve slower than would occur with the grazing systems included within Alternatives C and D. As juniper increases in dominance, ecological conditions are expected to deteriorate; negatively impacting Native Americans opportunity to exercise their traditional practices Native Americans' opportunity to exercise their traditional practices should not be impacted to a noticeable degree.

3.15.3.1.4.2 Community Stability

Another important social variable is "community stability". This may be defined as a community's capacity to handle change. This capacity is strongly influenced by the presence and strength of institutions such as the family, schools, churches, local governments and, social programs. Two important economic factors that impact a community's ability to handle change are; changes to its financial base, which affects the extent that tax supported services will be provided; and diversification of the economy, which influences the ability of community to "ride out" a downturn in one sector of the economy.

Although Jefferson County does not have as large of an economic base as Deschutes or Crook Counties, it is more diversified than Crook County. The importance of this fact was pointed out in the earlier economic discussion where it was noted that Jefferson County's economy was the least impacted during the recession of the early 1980s. Of the surrounding counties, Jefferson County's economy is less dependent on Federal lands than Crook County, but is much more so than Deschutes County. As a result, even though there will be some impacts to the County's financial base (fewer jobs in ranching and lower payments to counties because of eliminating grazing on the Grassland) under Alternative A, these institutions will remain relatively strong as the County's economy continues to expand and diversify. As a result, these institutions should remain fairly strong and aid in the County's ability to handle the changes caused by implementing Alternative A. The continued economic support associated with Alternatives B, C, and D should help strengthen the communities' capacity for change.

3.15.3.1.4.3 Attitudes, Beliefs, and Values/Community Cohesion

Attitudes, beliefs, and values are defined as the feelings, preferences, and expectations people have for forests and grasslands and the management and use of particular areas. Community cohesion is defined as the degree of unity and cooperation verses polarization in a community as it defines and attempts to resolve problems. These are both important social variables, and need to be considered, especially in light of changing forest and grassland management and the potential change in goods and services.

As previously discussed in the social makeup of the county's population, the area was and is still strongly influenced by rural culture. For the most part, all the affected communities are resource based and use the forests and Grassland for commodity production and recreational purposes (i.e. logging, grazing, hunting, fishing, firewood, etc.).

Within the County many people's attitudes, beliefs, and values have been shaped by the rural setting that they live in. As a result, livestock grazing is considered to be an appropriate use of Grassland administered lands. Alternative A would be perceived negatively within the county because it discontinues all livestock grazing across the entire Grassland. However, as Jefferson County's dependency on livestock and associated ranching products continues to decrease, its economic base and social institutions continue to diversify, and its ties to the urban communities of Bend and Redmond continue to increase; the attitudes, beliefs, and values represented in the County also become more and more diverse. As a result, although there will be many people who

find the No Action Alternative unacceptable, given the ever increasing social diversity and the relatively small economic impact, the county as a whole would not experience any wide spread social unrest. That is not to say that management changes associated with implementation of Alternative A might not result in a community outcry and corresponding political action.

The changes in grazing systems and restoration activities associated with Alternatives C and D should result in both; increased economic activity within local communities, and improved ecological conditions. This in turn should foster positive perceptions from most people within the surrounding communities. Alternative B will generally be well received within the county, but outside environmental groups and many recreationists may perceive Alternative B as catering to and subsidizing a lifestyle at the expense of the health and resilience of the shrub-steppe ecosystem.

3.15.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

3.15.3.2.1 Economy

The economic influence from implementation of any of the alternatives, including Alternative A, No Action, even when one includes ongoing (Grizzly Butte Juniper Density project, noxious weed treatments authorized under the 1998 Integrated Weed Management Plan, road maintenance, etc.) and likely future projects (e.g. additional weed treatment sites), is likely to be minimal within the economic context of Jefferson County as a whole. Employment trends within the County and throughout the Central Oregon area indicate increased job supply, primarily in construction, services, and trade. Although somewhat dated, the following quote summarizes Jefferson County's economic future, "Jefferson County, centering around the town of Madras and to a lesser extent Culver and Warm Springs, with its diversified manufacturing, agricultural and tourism based service sectors, should see continued economic growth. In addition, as more people move to Central Oregon for its "quality of life", Jefferson County will begin to attract folks away from Deschutes County because of its lower cost of living and "small town feel" (Oregon Employment Department 1992)".

3.15.3.2.2 Social

Over time, with the likelihood of increasing economic development and tourism within the County and the surrounding communities, economic conditions for most of the lifestyles found within the County, especially small town merchants, will continue to improve regardless of the alternative selected. Ranchers, to some degree, may experience more difficulties in maintaining their lifestyle as the County becomes more urban. This will be more pronounced under Alternative A, especially for those holding grazing permits on the Grassland.

Even though there will be some impacts to the County's financial base (fewer jobs in ranching and lower payments to counties because of eliminating grazing on the Grassland) under Alternative A, institutions (government, schools, social programs, etc.) will remain relatively strong and the economy will continue to expand and diversity. As a result, these institutions should remain fairly strong and aid in the County's ability to handle the social and economic changes caused by implementing Alternative A. The continued economic support associated with Alternatives B, C, and D should help strengthen the communities' capacity for change.

Over time, as the population continues to increase through immigration within Jefferson and the surrounding counties, many of these new people will have different values regarding resource management. This along with the increase in recreational use on the Grassland will most like result in domestic livestock grazing on the Grassland becoming increasingly contentious.

3.15.4 Forest Plan Consistency

All three action alternatives provide for continued grazing on the Grassland and are therefore consistent with the social and economic direction in the Grassland Plan. Alternative A on the other hand does not allow grazing by domestic livestock; therefore it is not consistent. Although Alternative B provides for a higher level of grazing than Alternatives C and D, Alternatives C and D meet this direction while instituting more ecologically sensitive grazing strategies. The vegetation treatments in Alternatives C and D will also ensure that the Grassland can provide environmental settings and products that contribute positively to social and economic conditions in the future.

3.16 Civil Rights and Environmental Justice

3.16.1 Current Management Direction (LRMP, FSM, etc.)

There are no standards and guidelines from the LRMP specific to this resource.

3.16.2 Affected Environment

Civil Rights legislation, especially the Civil Rights Act (CR) of 1964, Title VI, prohibits discrimination in National Grassland program delivery. The underlying principal behind the Civil Rights Act is that no activity shall negatively affect minorities, woman, or persons with disabilities by virtue of their race, color, sex, national origin, religion, age, disability, or material or familial status. Environmental Justice (EJ), Executive Order 12898, demands the fair treatment and meaningful involvement of all people. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from the execution of our actions. EJ focuses on minority, low-income groups, and subsistence lifestyles (including Indian Tribes). The purpose of involving these groups (EJ) and analyzing the effects upon them is to determine whether adverse civil rights impacts (CR) are anticipated, or whether disparate or disproportionate impacts associated with the alternatives are anticipated on any of these groups (CR/EJ).

The social and economic section identified both the American Indian and Hispanic population sizes as being substantially higher than those in surrounding counties or in Oregon as a whole. The minority population groups living in Jefferson County and the surrounding communities work in diverse occupations. However, some individuals may rely on Grassland products or related activities for their livelihood. This is especially true for the Hispanic population with many individuals making their livelihood from the ranching and farming activities within the County.

3.16.3 Environmental Effects

3.16.3.1 Direct and Indirect Effects

Alternative A would eliminate all grazing on the Grassland. Although the direct impacts would be minimal (see employment discussion), depending on how it affects the permittees base operations (their ranching, haying, and farming operations), the impact could be more far reaching. Speculation could produce several scenarios, both positive and negative, for instance if a permittee were to substitute the forage lost associated with the Grassland, with other private sources in the County, there could actually be increased employment opportunities for minority populations. On the other hand, if the loss of available Grassland forage resulted in the inability of the permittee to continue with their entire home operation, the impacts to minority populations would be more impacting. The most reasonable scenario is that the permittee would replace at least some of the loss of Grassland forage with other sources. Moreover, even if their base operations were threatened, it is unlikely that the land use patterns would change from haying and farming to a non-agricultural use. As a result, ranching and haying opportunities may be less, but given the small amount of labor needed to produce livestock outputs (labor per cow produced), the impacts on minority populations would be minimal.

Alternatives B, C, and D will support the local ranching and farming economic sectors at their current levels. This in turn will maintain existing employment opportunities for minority populations.

Seeding and juniper thinning is expected to span a period of ten years, and it is reasonable to expect a good proportion of the work will go to minority-based small businesses, as they have in the past (pers. com. Forster, 2004). Many of these businesses and their employees are based along the I-5

corridor; therefore, much of their disposable income would not flow into local communities. However, it is also expected that much of the employment will come from local sources. Alternative C, with its very aggressive restoration approach is expected to provide the most opportunity for minority employment, followed by Alternative D. Alternatives A and B do not provide for additional employment opportunities.

The social discussion in Chapter 3, Section 3.15.3.1.4 discusses the impacts the alternatives will have on resources of cultural importance, or gathered for subsistence and the subsequent impacts on Native Americans. The vegetation and changes in grazing management in Alternatives C and D should result in improving ecological conditions. This in turn would have positive effects on the ability of Native American people to participate in their traditional activities as historic shrub-steppe vegetation increases. Alternatives A and B without the vegetation treatments and more impact full grazing practices (Alternative B) would be somewhat negative as the shrub-steppe plant communities continue to decrease.

Firewood availability and accessibility would increase from the juniper treatments in Alternatives C and D. This intern would have a positive effect on low-income, older, and/or disabled individuals. Many individuals who fall into these groups may not be able to afford the type of vehicle needed to access more remote sites or physically manage firewood gathering from anything but very accessible sites.

The activities associated with this analysis would not be expected to alter the social and economic context of Jefferson County, or of the adjacent Deschutes and Crook Counties, which were considered within the analysis of the Forest and Grassland Plan.

The types of activities proposed within (thinning, planting, livestock management) and supported by (farming and ranching) Alternatives B, C and D, provide employment opportunities for minority populations and low-income groups. As a result, none of the action alternatives (A, B, or C) poses a disproportionately high or adverse effect to minority populations or to low income groups.

3.16.3.2 Cumulative Effects (refer to Appendix Y for a comprehensive listing of ongoing and future foreseeable actions)

When one includes ongoing (Grizzly Butte Juniper Density project, noxious weed treatments authorized under the 1998 Integrated Weed Management Plan, road maintenance, etc.) and likely future (e.g. additional weed treatment sites) projects, the economic influence from implementation of any of the action alternatives will be positive for minority populations and low-income groups. Employment trends also indicate increased job supply within the County, primarily in construction, services, and trade, all of which will be positive for minority populations and low-income groups, even under Alternative A

3.17 Additional Council on Environmental Quality, and Other Required Disclosures

3.17.1 Probable Adverse Environmental Impacts that Cannot Be Avoided

Grazing by any large ungulate, including deer, elk, pronghorn, or domestic livestock can cause some degree of damage to forage or browse plants or to soil structure. Most, but not all of these impacts can be mitigated for use by livestock through implementation of utilization standards (see FEIS, Chapter 2, Sections 2.4 and 2.5). In addition, intensification of management can insure that impacts are kept to acceptable levels. Impacts to riparian areas through the existence of current and past roads and structures in the riparian zones would continue. These impacts would limit recovery potentials and, in places, would prevent the reaching of desired future condition objectives.

3.17.2 Short-Term Uses of the Human Environment and the Maintenance of Long-Term Productivity

Forage harvest is a short-term use of the resources that is permitted over a ten-year period through a Grazing Agreement, but is managed on an annual basis. Forest Plan management requirements and project design criteria built into the action alternatives promote long term use and management of the range vegetative and related resources under management standards that are designed to promote long term health of the resources on each grazing allotment.

3.17.3 Irreversible and Irretrievable Commitment of Resources

None of the alternatives are expected to create any impacts that would cause irreversible damage to the resources of the Grassland.

Facilities necessary for management of grazing operations such as water developments, fences, cattleguards, and other similar facilities are considered irretrievable commitments of land and soil resources until such time as their functions have been served and the sites returned to productive capability. Under all alternatives, the amount of land dedicated to structural improvements would be the minimum necessary to meet management needs.

3.17.4 Potential Conflicts with Plans and Policies of Other Agencies

Implementation of Alternatives A, B, C, or D would not result in conflicts between the provisions of the proposed activities and any goals or objectives developed for other government entities.

3.17.5 Tribal Treaty Rights

Government-to-government consultation was initiated with Tribes in the early stages of the planning process.

On January 23, 2003, a letter was sent to the Burns Paiute and Klamath Tribes informing them of the project and requesting their comments, suggestions, and concerns. On January 27, a letter was sent to the Confederated Tribes of the Warm Springs requesting the same information. No response was received from the Burns Paiute or Klamath Tribes.

Letters were not sent to either the Confederated Tribes of the Grand Ronde or the Confederated Tribes of the Umatilla. The Confederated Tribes of the Grand Ronde indicated to us in a phone conversation that they were not interested in projects east of the crest of the Cascades. A phone call to the Confederated Tribes of the Umatilla also indicated that they had no concerns about the project as they considered it outside their area of interest.

On April 3, 2003 the Confederated Tribes of the Warm Springs Reservation in Oregon (CTWSR) Cultural and Heritage Committee toured the Grassland. Proposed vegetation treatment project sites were visited, livestock grazing was discussed, and cultural plants were identified and dug for personal use.

Under the 1855 Treaty with the Tribes of Middle Oregon, the CTWSR retain certain rights related to a variety of resources. The Treaty of 1855 contains the following provision:

> "That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations, in common with citizens of the United States, and of erecting suitable houses for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them."

Included in this decision are project design criteria (FEIS, Chapter 2, Section 2.5.1) to protect cultural plants. Specifically, pre-disturbance surveys of high-probability habitat for cultural plants will be conducted on 20 percent of the areas to be seeded. In addition, when cultural plant populations and/or habitat are encountered during vegetation management project planning, layout or execution they will be protected. Consultation with the Tribes will occur on an ongoing basis to ensure that all cultural values are being protected during implementation the decision made in association with this analysis.

Because treaties are the law of the land, the Forest Service has an obligation to manage National Forest resources in a manner that harmonizes the Federal trust responsibility to Tribes and the statutory mission of the agency. In their comments on the Draft EIS, the CTWSR expressed support for significant juniper removal and the other vegetation management actions proposed in the action alternatives that will enhance antelope and jackrabbit habitat.

3.17.6 Prime Farmland, Rangeland, and Forestland

Adverse effects on prime farmland, rangeland, and forestland not already identified in the FEIS for the Ochoco National and Crooked River National Grassland Forest Plan, are not expected from the implementation of the action alternatives.

3.17.7 Energy Requirements

There would be no unusual energy requirements from implementation of the alternatives.

3.17.8 Civil Rights, Women, Minorities, and Environmental Justice

See previous discussion of effects under Civil Rights and Environmental Justice earlier in this chapter (Section 3.16).

3.17.9 Wetlands and Floodplains

None of the alternatives analyzed are expected to impact wetlands or floodplains.

3.17.10 Inventoried Roadless Areas

In 1972 the Forest Service examined roadless areas generally larger than 5,000 acres to determine their suitability for inclusion in the National Wilderness Preservation System. This Roadless Area Review and Evaluation (RARE) was followed by a "RARE II" process in the late 1970s and 20 years of Forest planning. In that planning process, the RARE and RARE II inventories were used by the Forest Service to identify roadless areas to be considered for protection and management. These areas are referred to by the agency as "inventoried" roadless areas.

In the more than 20 years since the completion of RARE II, Congress has designated some of these inventoried roadless areas as Wilderness. Reviews of other inventoried roadless areas suitable wilderness designation have been conducted through the land management planning process and other large-scale assessments.

There are 61,000 acres of RARE II inventoried roadless areas on the Ochoco National Forest. The Deschutes Canyon-Steelhead Falls RARE II area on the Crooked River National Grassland is about 10,200 acres, with an additional 3,200 acres located on lands administered by the Bureau of Land Management (BLM) Land. The Deschutes Canyon-Steelhead Falls area was originally overlooked during the RARE II process. However, based on public input, it was later added and ultimately identified as a "further planning area" in the RARE II process.

In 1984 Congress passed the Oregon Wilderness Act (Public Law 98-328), which designated the Mill Creek, Bridge Creek, and Black Canyon areas on the Ochoco National Forest as Wilderness. The Act also required the Forest Service to review the Deschutes Canyon-Steelhead Falls RARE II area and make a recommendation in the Ochoco National Forest Land and Resource Management Plan (Forest Plan) as to the area's suitability for wilderness designation.

Therefore, in conjunction with the Forest Plan, the Forest Service and BLM conducted a joint study to evaluate the area's potential for wilderness. The joint study determined that the area is not suitable or manageable for wilderness because of included private land, proximity to heavily developed areas like the Cove Palisades State Park, impacts from early homesteading activities, and existing improvements such as roads, powerlines and fences.

Although the draft Forest Plan had proposed a 5,200-acre wilderness (2,500 acres National Grassland; 2,660 BLM), the findings of the joint study resulted in the proposal being dropped from the final Plan, which was completed in 1989. Instead, the Forest Plan designated 7,840 acres as the Squaw Creek Management Area, 5,100 acres of which were part of the Deschutes Canyon-Steelhead Falls area. This Management Area is managed to emphasize semi-primitive, non-motorized recreation in a pristine canyon setting while protecting and enhancing deer winter range habitat and fisheries. Another portion of the Deschutes Canyon-Steelhead Falls RARE II area was included in the Deschutes Scenic River Corridor under the Oregon Omnibus Wild and Scenic Rivers Act of 1988.

Current Forest Service policy directs that, until a forest-scale roads analysis is completed and incorporated into a forest plan, inventoried roadless areas shall, as a general rule, be managed to preserve their roadless characteristics. The policy also reserves to the Chief of the Forest Service the authority to make decisions affecting inventoried roadless areas if road construction or reconstruction or the cutting, sale or removal of timber are involved. No timber harvest or road construction or reconstruction in the Deschutes Canyon-Steelhead Falls RARE II area would occur under any of the alternatives.

GLOSSARY

Alteration Condition Threshold – The *Joint Aquatic and Terrestrial Programmatic Biological Assessment, June 2003 – June 2006*, indicates that the alteration condition threshold is 10 percent streambank alteration in association with Kentucky bluegrass dominated terraces and dry meadows.

Animal Unit (AU) - Defines forage consumption on the basis of one standard mature 1,000-pound dry cow (Adams 2004); all other classes and kinds of animals can be related to this standard, e.g.: a cow with a calf is equal to 1.32 AUs, a yearling steer or heifer is 0.7 AU, a mature bull is 1.25 AUs (Adams 2004).

Animal Unit Month (AUM) - The amount of forage needed to support a dry cow for one month, which is equal to 790 pounds of forage. Expressed in a stocking rate on the grasslands a good site would have a stocking rate of 2-4 acres/AUM while a poorer site would have a stocking rate of 15 acres/AUM (Adams 2004).

Channel Erosion - Channel erosion, including gullying, is defined as the movement of alluvium within swales and active channels. The extent of channel erosion is directly related to flow velocity, volume of flow, channel roughness, degree of flow containment, infiltration, capacity of floodplain and alluvial stream terraces, and effective bank cover.

Condition and Trend Cluster - During the 1950s and 1960s permanent Condition and Trend Clusters were established. These clusters were permanently marked on the ground using angle iron markers. Each cluster is usually comprised of three transects. Each transect is 100 feet long. These clusters have been read over the years providing plant composition data over time. Plant composition trends are well documented using these transects. There are 36 clusters located on the grasslands. They are generally located in designated monitoring areas. These clusters are summarized by watershed (Map 3 - Grazing Allotments, Designated Monitoring Area, C&T Cluster, and Range Ecological site Write-Up Locations Map).

Cultivar - a commercially created variety of a native species.

Deferred Rotation – Is a grazing system in which livestock are moved through each pasture of an allotment once during the grazing season (3-10 pastures).

Designated Monitoring Area – A designated area where stubble height monitoring will take place. Such an area should: 1) be among the most sensitive from the standpoint of fish habitat conditions (this is not always the case on the grasslands where fish habitat is scarce), 2) contain impacts that result principally from livestock grazing, 3) represent areas used by livestock, and 4) have the potential to respond quickly to, and measure changes in, grazing management.

Ecological Status – ratings are based on the similarity of current vegetation to the potential natural community. Include the degree of similarity between existing soil conditions and soil conditions at potential as measured by the degree of achievement of desired should quality standards. Express this similarity on a relative scale ranging from 1-100, with adjective ratings assigned as low, moderate, or high similarity.

Ecological Site – As used by the NRCS: the definition is based on the "historic climax plant community" (HCPC). An ecological site is a kind of land with specific physical characteristics, which differ from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management. The disturbance of fire is included when defining

the historic climax plant community. As used by the BLM and USFS: a kind of wildland (rangeland, woodland, or forest) with a specific potential natural community and specific physical site characteristics, differing from other kinds of wildland in its ability to produce vegetation and respond to management. Ecological sites are defined and described with soil, species composition and production emphasis. Ecological site is synonymous with range site in most cases. However when it refers to mesquite, catclaw, pinyon/juniper, or other juniper communities this is not the case. The ecological site would be called mesquite or acacia thorn scrub. Or in the case of pinyon/juniper and juniper the ecological site is call pinyon juniper woodlands or juniper woodlands.

Ecological Site Description – A formal description of the soils, uses and potential of a kind of land with specific physical characteristics to produce distinctive kinds and amounts of vegetation. These sites are described, written, and used as the basis for the Range Similarity Index which is used to compare the present vegetative or ecological condition to its potential or HCPC ecological condition.

Ecological Succession - The progressive changes in plant communities towards a steady state. Primary succession beings on a bare surface not previously occupied by plants, such as a recently deposited gravel bar. Secondary succession occurs following disturbances on sites that previously supported vegetation.

Ecological Trend - The direction of change on any existing ecological site relative to the historic climax of the ecological site. Trend is either moving toward the desired plant community, Not Apparent (Change not detectable), or Moving Away from the desired plant community. Using the NRCS protocol, eleven factors are observed and rated in order to determine trend. Of the eleven factors, five are Plant Factors and six are Soil Factors, they are: 1) vigor of desired key plants, 2) presence of seedlings and young desired plants, 3) presence of decadent plants, 4) presence of plant residues and litter, 5) presence of invading undesirable plants, 6) surface erosion, 7) crusting, 8) plant specie composition, 9) percent of bare soil, 10) presence of gullies and rills, and 11) overall soil degradation.

Ecological Type (also plant association/plant community)- A category of land having a unique combination of potential natural community, soil, landscape features, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Lacking potential natural community vegetation, ecological types can be developed with a provisional potential natural community based upon the present plant community and abiotic environmental factors. Categories of ecological types include all sites that have this unique combination of components with the defined ranges of all properties.

Fire Disclimax – The predominant vegetation state that persists under the influence of fire. Also is called Historic Climax Plant Community (HCPC) by the Natural Resource Conservation Service.

Grazing Allotment - A Grazing Allotment is a management area located on the federal lands. Normally an allotment is divided into pastures (usually 2-10 in number). Assigned to each allotment are permitted livestock along with a grazing period or season. For example the Blanchard Allotment has 2,113 authorized animal unit months (AUMs). These AUMs are held by two different permittees who hold the privilege to graze on this allotment. Grazing management direction for each allotment is described in the Allotment Management Plan. These plans cover a 10-year implementation period.

Historic Climax Plant Community (HCPC) - The plant community that is prevalent under natural fire regime. This term is synonymous with fire disclimax. See above.

Historic Conditions – Estimated historic distribution by seral/structural stage (for a given PAG).

Historic Range of Variability (HRV) - An estimation of the historic range of a given variable.

Land Use - On the grasslands approximately half of the area was farmed at or around the turn of the last century. Following the farming era these farmed sites were seeded to crested wheatgrass, Whitmar (beardless bluebunch wheatgrass) (beardless bluebunch wheatgrass or other plant specie. Therefore "Land Use" describes whether the site is a "Seeded" or "Native" site.

Mass Wasting - Mass wasting is the downslope movement of a portion of the landscape under direct application of gravitational forces. Mass wasting has been documented as an important post-fire, post-roading, post-harvest or post-overgrazing phenomenon. Causative mechanisms and processes of mass erosion are complex and generally not well studied. How ever the principal elements responsible for mass erosion in most areas are elimination of stability provided by roots of vegetation and high soil water pressures resulting from removal of transpiration draft. Roadcuts on steep slopes often destabilize the material above the cut. Streams also undercut old landslide deposits and can cause large volumes of material to fall into the active channel. These features are relictual and largely inactive. Active slides are occurring along the steep canyon walls of Lake Billy Chinook, especially on the main access road. Another form of mass erosion termed dry creep or dry ravel occurs on steep slopes with soils that are high in coarse materials and low in cohesion. Removal of protective cover allows the soil particles to easily move downslope under the influence of gravity.

Overland Flow - Overland flow occurs when the infiltration rate or capacity of a soil has been exceeded by the amount of incoming precipitation or by the rate of snowmelt. Independent variables include all the soil and plant factors that influence infiltration rate, intensity and duration of precipitation, steepness of slope and whether or not the soil is frozen (Wisler and Brater 1959).

Plant Association - If a stand is able to develop and persist in its environment, and if the competitive forces are without major disturbing influences, then following a relatively long period of time those plants capable of reproducing in competition will constitute the "climax community. The unit of classification based on the probable, or projected, climax community type is defined as the 'plant association' (R6 Ecology Glossary Committee, 1989). As a combination of similar or compensating environmental factors are repeated across the landscape, a predictable plant community will occupy those sites given time and the lack of disturbance. This will be a climax community comprising the basis for the plant association classification.

Plant Association Group (PAG) - Plant associations grouped based upon similar successional responses to disturbance.

Potential Natural Community (PNC) - The biotic community that would be established if all successional seque4nces of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances such as drought, floods, wildfire, insects, and disease, are inherent in the development of potential natural communities which may include naturalized nonnative species.

Potential Natural Vegetation (PNV) - This is the plant association that will develop in an undisturbed environment. Disturbances to the environment that hinder/restrict the development of potential natural vegetation (or climax community) include fire, windstorms, grazing, flooding, and human induced activities such as timber harvest.

Range Condition- The present status of vegetation of a range site in relation to the historic climax or natural potential plant community for the site. Range condition is expressed as a percentage of climax plant community presently occurring on the range site and grouped into the following range condition classes:

Range condition class	Percentage of climax plant community present on the site
Excellent	76-100
Good	51-75
Fair	26-50
Poor	0-25

Rangeland Health - Defined as the degree to which the integrity of the soil, the vegetation, the water and the air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as maintenance of the structure and functional attributes characteristic of a particular locale, including normal variability. Seventeen attributes are evaluated, they are: 1) presence of rills, 2) water flow patterns, 3) presence of pedestals caused by wind or water erosion, 4) amount of bare ground, 5) presence of gullies, 6) evidence of wind erosion, 7) presence of cryptobiotic crusts, 8) condition of the soil surface, 9) infiltration capacity and surface runoff, 10) plant mortality, 11) functional plant groups, 12) litter distribution, 13) litter amount, 14) evidence of plant stress, 15) production, 16) presence of invasive plants, and 17) recruitment or reproduction of desirable plant specie. Each attribute is rated in one of five classes or categories. "Extreme" represents the most degraded condition.

Rest Rotation – A grazing system similar to deferred rotation system but one pasture is completely rested from grazing each year. The rest pasture is rotated each year.

Rosgen Classifications and descriptions - The Rosgen stream classification system is widely used for analysis of stream channels because it permits simple communication of channel characteristics and provides a method for interpretation of channel development and stability. In general terms, A-type channels are relatively steep, straight and confined (e.g. mountain stream), B-type channels are transitional between A and C-type channels, and C-type channels are relatively low-gradient, meandering and have relatively wide channels and floodplains (e.g. Crooked River). E-type channels meander more tortuously than C-type channels and tend to be relatively narrower and deeper. F and G-type channels are generally rejuvenating channel forms roughly described as troughs and gullies, respectively. Numbers following the letter indicate the mean streambed particle size typically found in association with the channel-type. Sediment particle size decreases with the size of the number with 1 being bedrock and 6 clay/silt. The general distribution of Rosgen channel types in the analysis area is summarized below

Season Long - In relation to grazing systems occurs when livestock remain in one pasture during the grazing season until stubble height standards are met (1 pasture).

Seral/structural stage- A combination (matrix) of three seral stages (early, mid, and late, based upon species shade tolerance) and five tree size classes (grass/forb/shrub, <4.0" dbh, 5"-8.9" dbh, 9"-20.9"dbh, >21"dbh). Within the western juniper PAG, seral stage is based upon a climatic climax condition (this would be exclusion of a historic fire regime).

Short Duration (also high intensity/short duration, Savory) – In relation to grazing systems occurs when livestock are moved rapidly through a series of pastures. Some pastures may be grazed twice during the grazing season if growing conditions allow, while meeting stubble height standards (5-10 pastures).

Similarity Index - The present state of vegetation and soil protection on an ecological site in relation to the historic climax plant community. The index number is a relative number between 1 and 100. The higher the number or percent the closer the present is to the historic climax plant community.

Surface Erosion – Surface erosion, including sheet erosion and rilling, is defined as the movement of individual soil particles by water or wind and is a function of forces available, protection afforded the soil surface and the inherent erodability of the soil. Disturbance or removal of vegetative cover increases available forces by increasing effective precipitation, wind movement and overland flow.

Useable Production - After the reconstructed weight is calculated another adjustment is made in order to calculate livestock stocking rates. The Reconstructed Weight considers all plant specie on the site by weight, many of which are either not available (due to height above the ground) or not palatable to livestock. For example, western juniper is neither palatable nor available to livestock due to its growth characteristics but may contribute considerable weight to the Reconstructed Weight of a site. Therefore the unavailable and unpalatable plant specie weights are subtracted from the Reconstructed Weight of a site leaving only available plant specie weights to be considered for livestock stocking. This altered weight (after the unavailable and unpalatable species are removed) is Useable Production.

Useable Production/Livestock Allocation - A Harvest Efficiency is applied to the Useable Production in order to calculate stocking rates. Historically range science used a take half leave half approach to stocking rates. In our present Land and Resource Management Plan a 50 percent utilization standard is generally used. The NRCS standard Harvest Efficiency is between 25 - 35 percent depending on the topography and plant specie available to be grazed. For the 2001 Range Ecological Site Condition & Trend Survey the grassland used a 30 percent harvest efficiency. 30 percent is conservative and allows for forage for wildlife, plant health, and scenic values. In other words, 30 percent of the Useable Production is allocated to livestock grazing and 70 percent is left for all other uses and needs. The Crooked River Grassland Land and Resource Management Plan (Grassland Plan) allows for higher Harvest Efficiency than calculated in the 2001 Inventory. The Grassland Plan uses Harvest Efficiencies of 40 percent and/or higher.

Vegetation Composition - During the Ecological Site Condition & Trend Survey the plant specie composition was determined at each "Write-Up" location by walking the area and identifying all plant species encountered. Following identification the site was "clipped and weighed". A "green weight" was assigned to each species encountered. The "green weights" were then adjusted to a "dry weight".

ACRONYMS

AMP	Allotment Management Plan
AUM	Animal Unit Month
BECA	Bald Eagle Consideration Area
BEMA	Bald Eagle Management Area
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	Carbon monoxide
COHVOPS	Combined Off-Highway Vehicle Operations
CORPT	Central Oregon Recreation Permit Team
COWS	Central Oregon Wildfire School
CRNG	Crooked River National Grassland
CTWSR	Confederated Tribes of the Warm Springs Reservation
EIS	Environmental Impact Statement
EFH	Essential Fish Habitat
FERC	Federal Energy Regulating Commission
FSM	Forest Service Manual
GIS	Geographic Information System
GBGA	Gray Butte Grazing Association
HRV	Historic Range of Variability
HUC	Hydrologic Unit Code
HPCP	Historical Potential Plant Community
ISAT	
LBC	Lake Billy Chinook
ICBEMP	The Interior Columbia Basin Ecosystem Management Project
LRMP	Land and Resource Management Plan
LCS	Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington (LCS) was prepared in 2000 by Altman and Holmes for Oregon-Washington
LUP	Land Use Project
MA	Management Allocation
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NF	National Forest
NL	Non Lethal
NRCS	Natural Resource Conservation Service
NVUM	National Visitor Use Monitoring

OHMIS	Oregon Heritage Management Information System
OHV	Off Highway Vehicle
OWRD	Oregon Water Resources Department
PAG	Plant Association Group
PAOT	Persons At One Time
PDC	Project Design Criteria
PGE	Portland General Electric
PM2.5	particulate matter that measures 2.5 micrometers or less.
PM10	particulate matter that measures 10 micrometers in diameter or less
PP	Ponderosa Pine
RHCA	Riparian Habitat Conservation Area
RM	River Mile
RNA	Research Natural Area
ROS	Recreation Opportunity Spectrum
SCS	Soil Conservation Service
SHPO	State Historical Preservation Office
USGS	U.S. Geological Survey
USFS	United States Forest Service
USDI	United States Department of the Interior
VAM	vesicular-arbuscular mychorrhizae fungi
VF	Very Frequent
VQO	Visual Quality Objective
VEMG	Viable Ecosystems Management Guide
WUI	Wildland Urban Interface
WJ	Western Juniper

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AGENCIES and ORGANIZATIONS CONSULTED

Elected Officials

Jefferson County Board of Commissioner
Crook County Judge

Tribal Groups

Burns Paiute Tribe
Confederated Tribes of Warm Springs

Agencies

Bonneville Power Administration
Crook county Soil and Waters Conservation District
Department of Environmental Quality
Deschutes county Soil and Water conservation District
Jefferson county Fire Department
Jefferson County Court
Jefferson County Farm Bureau
Jefferson County soil and Water Conservation District
NOAA
NRCS
Oregon Department of Fish and Wildlife
Oregon State University – Range Department
Oregon State University Extension Service
Portland Gas Electric
U.S. Fish and Wildlife Service
USDI/ Bureau of land Management

Organizations/Businesses

American Forest Resources Council
American Rivers
Cascade natural Gas
Central Oregonian
Community Solutions
Crook County Natural Resources Advisory Committee
Crook county Historical Society
Deschutes Resources conservancy
FLOW
Full circle
Gray Butte Grazing Association
Jefferson county Historical Society
Madras Pioneer
Malhuer Timber Operators
NW Environmental Defense Center
Ochoco Lumber
Oregon Cattlemen's Association
Oregon Natural Desert Association
Oregon Natural Resources Council
Oregon Trout
Pacific Gas Transmission
Pacific Power and Light
Prineville Ridge Riders
Raven Research
Redmond Chapter Oregon Hunter's Association
Sierra Club, Juniper Group
The Bulletin
The Nature Conservancy
The Wilderness Society
Trust for Public land

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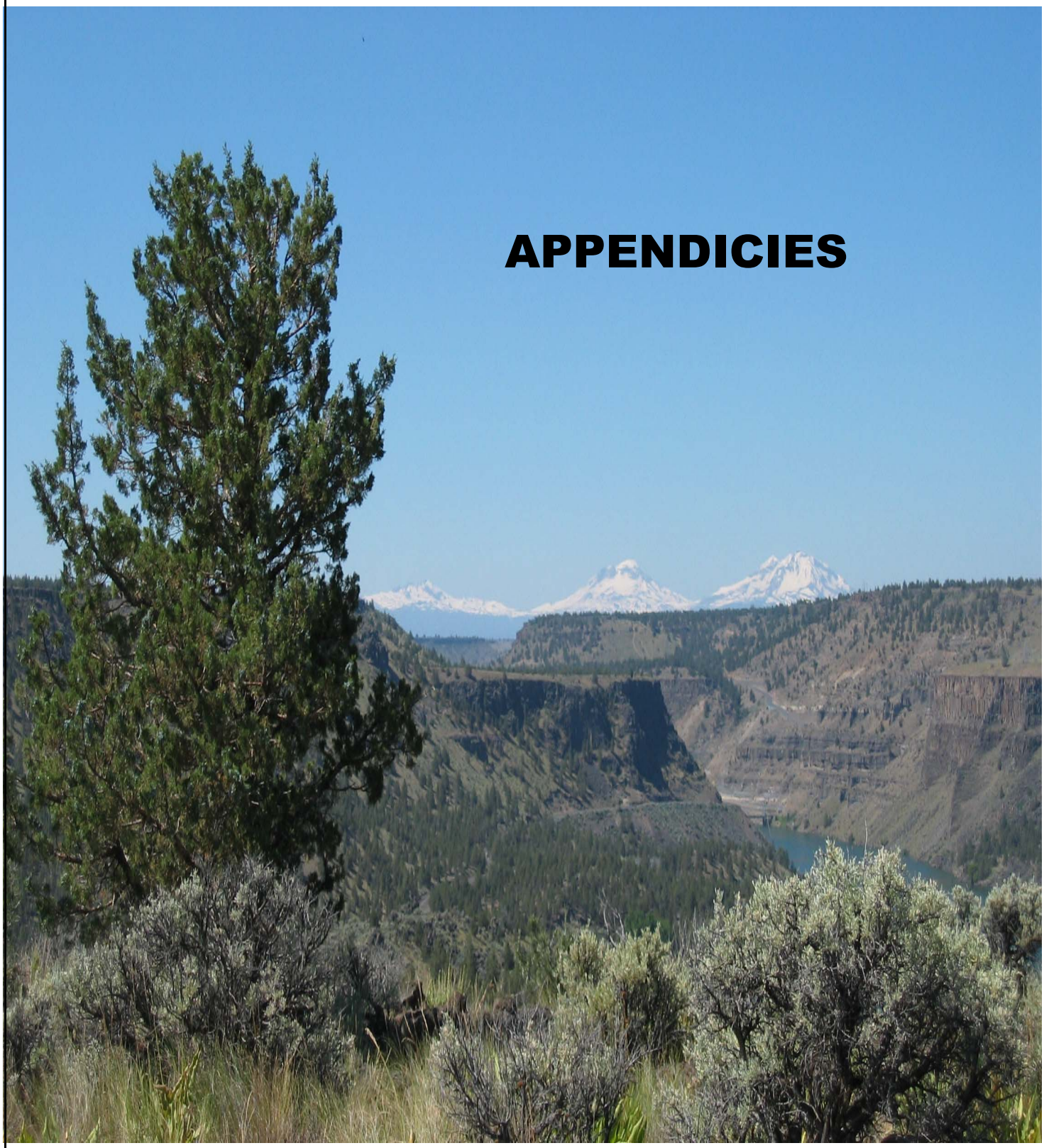

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Appendix A Map List

<u>Appendix A</u> Map List

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<u>Appendix B</u> Stringham, Tamzen Letter 11/12/03

(The original letter is on file at the Grassland Office in Madras, Oregon)

DEPARTMENT OF RANGELAND RESOURCES

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11/12/03

In order to have a meaningful discussion on the potential repair of degraded or damaged rangelands it is necessary to describe the framework I use for assessment of function and determination of possible repair strategies. Fully functioning (healthy) ecosystems have autogenic or built-in repair mechanisms that are inherent to the physical attributes and the pre-degraded biotic components of the system. Damage to the ecosystem through any number of, or combinations of disturbances can override the systems capacity for self-repair. After crossing the self-repair threshold, active intervention is required to restart the natural recovery processes of the damaged ecosystem. Therefore, the framework I ascribe to for development of repair strategies is (1) process-oriented; (2) seeks to initiate plant-driven repair; and (3) considers landscape position and interactions. The first step in this approach is to assess the current function level of the three primary ecological processes (hydrologic cycle, nutrient cycle and energy capture). The next step focuses on identifying the controlling factors in regards to the functionality of the primary processes. For example, a sagebrush-steppe community dominated by deep-rooted, perennial bunchgrasses and 10 to 20 % cover of sagebrush is likely being controlled by the biotic community. The plant community is providing adequate protection of the soil from raindrop impact, for litter additions to soil OM, for root turnover throughout the soil profile, for energy capture throughout the growing season and for season-long nutrient cycling. The site is capable of self-repair. However, if juniper were to encroach, overtime the control of the primary processes would shift from the current biotic community to juniper. As this shift occurs, bareground increases, herbaceous litter decreases, species begin to decline in number and vigor, root turnover declines, energy capture and nutrient cycling are truncated both spatially and temporally. The outcome is a reduction or degradation in the level of function of the primary ecological processes. The resistance and resilience of the ecosystem declines and the ability to self-repair after disturbance is reduced. As degradation continues the site could cross a physical threshold referred to as the abiotic threshold. If this occurs site processes are being controlled by the physical environment. Once the controlling factors have been identified then the third step is to assess what resources are currently on site that could be manipulated to stop the negative and promote the positive and, in addition, what resources may need to be brought in to assist in the repair process. Most rangeland repair strategies focus on establishing a specified suite of plant species rather than on the repair of processes and they view the improvement program as the endpoint rather than the tool for promoting plant-driven repair.

In the assessment of the current functionality of the primary processes on the site in question there are a number of resources I prefer to use. These are; (1) soil map; (2) ecological site description; (3) climate data; (4) local knowledge; (5) history; (6) shovel; (7) Interpreting Indicators of Rangeland Health (Pellant et al. 2000) and; (8) my brain. In developing repair strategies I prefer the ecological framework described

above with the use of agronomic techniques to promote site function not to establish some pre-determined group of species.

Crooked River National Grasslands Discussion

On September 23, 2003 a group of rangeland scientists and professionals visited the CRNG with the primary purpose of identifying project sites for the OSU Rangeland Resources course titled Wildland Restoration and Ecology. The group included me, Dr. Lee Eddleman (OSU Rangeland Resources), Tim Deboodt (OSU Extension), Pat Shaver (NRCS Grazing Land Institute), Tory Kurtz (CRNG). During this trip we visited a number of areas that had been farmed and abandoned and subsequently seeded to Crested wheatgrass and alfalfa. The majority of the areas we visited were on one of two soil map units: LaC (Lamonta) and GrD (Gribble). The ecological site descriptions associated with these soil map units are Loamy 10-12 and John Day Clayey 12-16 respectively. Tory Kurtz provided the group with the CRNG condition and trend data within the Grizzly and Lone Pine allotments. We visited a number of these locations.
I will summarize our discussion at the C&T cluster #3 located with a Loamy 10-12 ecological site on Lamonta soil.

Summary of Cluster 3# Location

This site is located approximately 1 mile SW of the BPA Substation. According to the CRNG historical records the site was plowed and seeded in 1947 to crested wheatgrass (Agcr) and alfalfa. The C&T data indicate that Agcr composed 84.7% of the stand in 1955, 96.7% in 1961 and 28.7% in 2001. Sandberg's bluegrass (Pose) has increased from < 1% in 1955 and 1961 to 47.0% today. In addition, Bulbous bluegrass (Pobu) composes 18.3% of the current day community. Both Pose and Pobu are shallow-rooted, early season, perennial plants. Although the historical record does not mention shrub control, the lack of sagebrush (< 1%) indicates shrubs were most likely sprayed at some point in time. Recently, juniper has been cut on this site. The ecological site description for this location indicates the historic plant community was dominated by bluebunch wheatgrass at 30-45% and Idaho Fescue at 15-30% with less than 10% Sandberg's bluegrass and up to 5% Thurber's needlegrass. In addition, up to 20% of the community should be made up of bitterbrush and big sagebrush.

A number of shallow soil pits were dug and a cemented ash layer (tuff) was found within 20 inches of the surface. This soil feature tends to favor Idaho fescue over bluebunch wheatgrass and sagebrush over bitterbrush. In addition, the risk factor for juniper invasion is lower than on soil underlain with fractured basalt or non-cemented ash. Drill rows are evident and appear to run primarily downslope. It is interesting to note that Sandberg's bluegrass is dominating on the mini-ridge lines between the rows. Much discussion ensued concerning this pattern of plants on top of the "ridges" and bareground in the depressions. The consensus of the group was as Sandberg's became the dominate the site's ability to retain soil declined (shallow mat-rooted, small stature plant) and 2 to 4 inches of soil has been lost through both water and wind erosion. The group recognized historic soil erosion prior to crested wheatgrass and after abandonment had occurred, however, the opinion was the domination of Sandberg's bluegrass has further facilitated soil erosion.

A Rangeland Health Assessment was conducted on the site with the following results.

Rangeland Health Attributes		Extreme	Moderate to Extreme	Moderate	Slight to Moderate	None to slight
S	Soil/Site Stability (Indicators 1-6, 8, 9 & 11)			**X**		
H	Hydrologic Function (Indicators 1-5, 7-11 &14)			**X**		
B	Biotic Integrity (Indicators 8-9 & 11-17)			**X**		

The assessment indicates that the site exhibits moderate departure from expected function. The hydrologic cycle was historically impacted by the agronomic disturbance to the soil and has continued to degrade as shallow-rooted, early-season, grasses have replaced the deeper-rooted crested wheatgrass. Soil pits showed a significant mat-type layer of Pose roots within the top 2 to 4 inches of the soil both beneath plants and throughout the interspace. This type of rooting structure indicates the site is fully occupied by Pose and seedling establishment of other species would be difficult. In addition, water flow paths are developing and Sandberg's bluegrass is pedestaled in many places. Soil pavement is evident and indicates soil loss has occurred. The temporal scale of energy capture has been substantially shortened and below ground nutrient cycling has been seriously truncated. Sandberg's bluegrass produces little above ground biomass and what it does produce decomposes rapidly. The role of litter on the soil surface; protection from raindrop impact, moderation of soil temperature, increased retention of soil water, safe sites for seed germination; has been greatly reduced as the site has degraded to Sandberg bluegrass domination. The increase in Sandberg's bluegrass has set up a positive feedback loop that promotes the Sandberg bluegrass community at the expense of deep rooted perennials. In other words, Pose is controlling site processes. The decrease in the ability of the site to capture, store and safely release water to plants has effectively dried the site out. Sandberg's bluegrass is an early season grower that can utilize water in the near surface profile before the seedlings of Idaho fescue or bluebunch wheatgrass begin growth. In the event that the deep-rooted bunchgrass seedlings have the opportunity to begin growth the probability of survival beyond July, due to increased soil temperature and decreased soil moisture, is quite low. The consensus of the group in regards to repair strategies was to focus on increasing soil water availability to plants both spatially and temporally through reduction in Pose domination and an increase in deep-rooted perennial plants. Specific seeding mixes were not discussed but concern was raised over probability of seeding failure if late seral native plants were the only option.

Gribble Soil

The primary difference between the Gribble and Lamonta soil units, from a plants perspective, is in the depth to and type of restrictive layers. The Gribble soil tends to be deeper than the Lamonta and is underlain with fractured basalt instead of ash. The potential native plant communities are quite similar, however, bitterbrush, juniper, and bluebunch wheatgrass prefer the Gribble soil over the Lamonta. On the sites we visited that had been farmed and abandoned and subsequently seeded to crested wheatgrass and alfalfa the same issues with Sandberg's bluegrass were noted. However, additional concerns on these sites included cheatgrass, medusahead and juniper. Some areas, where the soil had rock in the near surface profile, had significant residual stands of native, deep-rooted bunchgrasses. Repair strategies under these conditions would initially focus on weed control, Sandberg's bluegrass and juniper manipulation. Seeding to deep-rooted species in the future would certainly need to be considered.

The above discussion is solely an opinion and is not supported by research data from these sites. The opinion is based on discussions and qualitative investigations in the field by a team of experienced rangeland scientists and professional managers.

I would be happy to discuss this opinion further with those parties interested in the ecology of the Crooked River National Grasslands.

Tamzen Stringham
Asst. Professor

<u>Appendix C</u> Cover Type by Allotment (Existing Conditions, HRV and the Difference)

Table A- 1 Cover Type by Allotment (Existing Conditions, HRV, Difference)

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
BLANCHARD	**E1g**	600	0	1154	15%	1212	21%	1183	18%	-554	-15%	-612	-21%	-583	-18%
Willow Creek	**E1s**	4835	71%	2693	35%	2828	49%	2760	42%	2142	36%	2007	22%	2075	29%
	M2	1887	24%	0	0%	577	10%	289	5%	1887	24%	1310	14%	1598	19%
	M3	267	3%	385	5%	577	10%	481	8%	-118	-2%	-310	-7%	-214	-4%
	L4a	74	1%	0	0%	0	0%	0	0%	74	1%	74	1%	74	1%
	L4b	31	0%	1154	15%	1731	30%	1443	23%	-1123	-15%	-1700	-30%	-1412	-22%
	L5b	0	0%	385	5%	692	12%	539	9%	-385	-5%	-692	-12%	-539	-9%
Total		7694	100%	5770	75%	7617		6694	104%						
BOYCE	**E1g**	2000	0%	848	15%	1187	21%	1018	18%	1152	-15%	813	-21%	982	-18%
Deschutes South	**E1s**	3432	96%	1979	35%	2770	49%	2374	42%	1453	61%	662	47%	1058	54%
	M2	221	4%	0	0%	565	10%	283	5%	221	4%	-344	-6%	-62	-1%
	M3	0	0%	283	5%	565	10%	424	8%	-283	-5%	-565	-10%	-424	-8%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0	0%	848	15%	1696	30%	1272	23%	-848	-15%	-1696	-30%	-1272	-23%
	L5b	0		283	5%	678	12%	481	9%	-283	-5%	-678	-12%	-481	-9%
Total		5653	100%	4240	75%	7462	132%	5851	104%						
CANADIAN BENCH	**E1g**	200	0%	239	15%	334	21%	287	18%	-39	-15%	-134	-21%	-87	-18%
Lake Billy Chinook	**E1s**	799	25%	557	35%	780	49%	669	42%	242	-10%	19	-24%	130	-17%
	M2	521	13%	0	0%	159	10%	80	5%	521	13%	362	3%	441	8%
	M3	72	2%	80	5%	159	10%	119	8%	-8	-3%	-87	-8%	-47	-6%
	L4a			0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0	0%	239	15%	478	30%	358	23%	-239	-15%	-478	-30%	-358	-23%
	L5b			80	5%	191	12%	135	9%	-80	-5%	-191	-12%	-135	-9%
Total		1592	100%	1194	75%	2101	132%	1648	104%						
CLEVENGER	**E1g**	0	0%	96	15%	134	21%	115	18%	-96	-15%	-134	-21%	-115	-18%
Steelhead	**E1s**	0	0%	223	35%	313	49%	268	42%	-223	-35%	-313	-49%	-268	-42%
	M2	167	26%	0	0%	64	10%	32	5%	167	26%	103	16%	135	21%
	M3	471	74%	32	5%	64	10%	48	8%	439	69%	407	64%	423	66%
	L4a			0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0	0%	96	15%	192	30%	144	23%	-96	-15%	-192	-30%	-144	-23%
	L5b			32	5%	77	12%	54	9%	-32	-5%	-77	-12%	-54	-9%
Total		638	100%	479	75%	843	132%	661	104%						
CYRUS	**E1g**	1200	0%	1399	15%	1958	21%	1679	18%	-199	-15%	-758	-21%	-479	-18%

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
Crooked River Grasslands	**E1s**	1907	33%	3264	35%	4569	49%	3917	42%	-1357	-2%	-2662	-16%	-2010	-9%
	M2	2967	32%	0	0%	933	10%	466	5%	2967	32%	2034	22%	2501	27%
	M3	2462	26%	466	5%	933	10%	699	8%	1996	21%	1529	16%	1763	19%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	789	8%	1399	15%	2798	30%	2098	23%	-610	-7%	-2008	-22%	-1309	-14%
	L5b			466	5%	1119	12%	793	9%	-466	-5%	-1119	-12%	-793	-9%
Total		9325	100%	6994	75%	12309	132%	9651	104%						
DUMP	**E1g**	93	0%	71	15%	99	21%	85	18%	22	-15%	-6	-21%	8	-18%
Willow Creek	**E1s**	300	82%	165	35%	231	49%	198	42%	135	47%	69	33%	102	40%
	M2	78	15%	0	0%	47	10%	24	5%	78	15%	31	5%	54	10%
	M3	0	0%	24	5%	47	10%	35	8%	-24	-5%	-47	-10%	-35	-8%
	L4a	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0	0%	71	15%	141	30%	106	23%	-71	-15%	-141	-30%	-106	-23%
	L5b			24	5%	57	12%	40	9%	-24	-5%	-57	-12%	-40	-9%
Total		471	100%	353	75%	622	132%	487	104%						
FOX	**E1g**	1000	5%	863	15%	1208	21%	1036	18%	137	-10%	-208	-16%	-36	-13%
Mud Springs Creek	**E1s**	1824	44%	2014	35%	2820	49%	2417	42%	-190	9%	-996	-5%	-593	2%
	M2	1993	34%	0	0%	575	10%	288	5%	1993	34%	1418	24%	1705	29%
	M3	666	12%	288	5%	575	10%	432	8%	378	7%	91	2%	234	5%
	L4a	271	5%	0	0%	0	0%	0	0%	271	5%	271	5%	271	5%
	L4b	0	0%	863	15%	1726	30%	1295	23%	-863	-15%	-1726	-30%	-1295	-23%
	L5b			288	5%	690	12%	489	9%	-288	-5%	-690	-12%	-489	-9%
Total		5754	100%	4316	75%	7595	132%	5955	104%						
GOLDMINE/FALLS	**E1g**	50	0%	108	15%	151	21%	130	18%	-58	-15%	-101	-21%	-80	-18%
Steelhead	**E1s**	278	41%	252	35%	353	49%	302	42%	26	6%	-75	-8%	-24	-1%
	M2	330	41%	0	0%	72	10%	36	5%	330	41%	258	31%	294	36%
	M3	54	7%	36	5%	72	10%	54	8%	18	2%	-18	-3%	0	-1%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0	0%	108	15%	216	30%	162	23%	-108	-15%	-216	-30%	-162	-23%
	L5b	0		36	5%	86	12%	61	9%	-36	-5%	-86	-12%	-61	-9%
	Rip	8	0%	0											
Total		720	100%	540	75%	950	132%	745	104%						
GORGE	**E1g**	300	0%	177	15%	248	21%	213	18%	123	-15%	52	-21%	87	-18%
Crooked River Grasslands	**E1s**	421	61%	414	35%	579	49%	497	42%	7	26%	-158	12%	-76	19%
	M2	293	25%	0	0%	118	10%	59	5%	293	25%	174	15%	234	20%
	M3	127	11%	59	5%	118	10%	89	8%	68	6%	9	1%	39	3%

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
	L4a	21	2%	0	0%	0	0%	0	0%	21	2%	21	2%	21	2%
	L4b	20	2%	177	15%	355	30%	266	23%	-157	-13%	-334	-28%	-246	-21%
	L5b			59	5%	142	12%	100	9%	-59	-5%	-142	-12%	-100	-9%
Total		1182	100%	887	75%	1561	132%	1224	104%						
GRIZZLY	**E1g**	1409	2%	1377	15%	1928	21%	1652	18%	32	-13%	-519	-19%	-243	-16%
	E1s	3818	54%	3213	35%	4498	49%	3855	42%	605	19%	-680	5%	-37	12%
	M2	2048	22%	0	0%	918	10%	459	5%	2048	22%	1130	12%	1589	17%
	M3	1553	17%	459	5%	918	10%	688	8%	1094	12%	635	7%	865	9%
	L4a	12	0%	0	0%	0	0%	0	0%	12	0%	12	0%	12	0%
	L4b	338	4%	1377	15%	2754	30%	2065	23%	-1039	-11%	-2415	-26%	-1727	-19%
	L5b	0		459	5%	1101	12%	780	9%	-459	-5%	-1101	-12%	-780	-9%
Total		9179	100%	6884	75%	12116	132%	9500	104%						
HOLMES-SQUAW CREEK	**E1g**	614	8%	989	15%	1384	21%	1186	18%	-375	-7%	-770	-13%	-572	-10%
Whychus	**E1s**	792	10%	2307	35%	3230	49%	2768	42%	-1515	-25%	-2437	-39%	-1976	-32%
	M2	4119	53%	0	0%	659	10%	330	5%	4119	53%	3460	43%	3789	48%
	M3	239	3%	330	5%	659	10%	494	8%	-90	-2%	-420	-7%	-255	-4%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	650	8%	989	15%	1977	30%	1483	23%	-339	-7%	-1327	-22%	-833	-14%
	L5b	0		330	5%	791	12%	560	9%	-330	-5%	-791	-12%	-560	-9%
	Rip	176	2%	0											
Total		6591	100%	4943	75%	8700	132%	6822	104%						
JUNIPER BUTTE	**E1g**	1107	8%	1133	15%	1586	21%	1360	18%	-26	-7%	-479	-13%	-253	-10%
Crooked River Grasslands	**E1s**	3321	51%	2644	35%	3701	49%	3173	42%	677	16%	-380	2%	148	9%
	M2	2634	34%	0	0%	755	10%	378	5%	2634	34%	1879	24%	2256	29%
	M3	492	6%	378	5%	755	10%	567	8%	114	1%	-263	-4%	-75	-1%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		1133	15%	2266	30%	1700	23%	-1133	-15%	-2266	-30%	-1700	-23%
	L5b	0		378	5%	906	12%	642	9%	-378	-5%	-906	-12%	-642	-9%
Total		7554	100%	5666	75%	9971	132%	7818	104%						
KENNEDY	**E1s**	700	100%	33	15%	46	21%	40	18%	667	85%	654	79%	660	82%
Total		700	100%	30	15%	42	21%	36	18%	689	85%	683	79%	683	82%
LONE PINE	**E1g**	885	5%	1383	15%	1937	21%	1660	18%	-498	-10%	-1052	-16%	-775	-13%
Lower Crooked River Valley	**E1s**	2061	27%	3228	35%	4519	49%	3873	42%	-1167	-8%	-2458	-22%	-1812	-15%
	M2	3110	34%	0	0%	922	10%	461	5%	3110	34%	2188	24%	2649	29%
	M3	3091	34%	461	5%	922	10%	692	8%	2630	29%	2169	24%	2399	26%

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
	L4a			0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	75	1%	1383	15%	2767	30%	2075	23%	-1308	-14%	-2692	-29%	-2000	-22%
	L5b			461	5%	1107	12%	784	9%	-461	-5%	-1107	-12%	-784	-9%
Total		9222	100%	6917	75%	12173	132%	9545	104%						
LOWER DESERT	**E1g**	290	1%	1757	15%	2459	21%	2108	18%	-1467	-14%	-2170	-20%	-1818	-17%
Lake Billy Chinook	**E1s**	2348	10%	4099	35%	5738	49%	4919	42%	-1751	-25%	-3390	-39%	-2571	-32%
Whychus	**M2**	2511	11%	0	0%	1171	10%	586	5%	2511	11%	1340	1%	1925	6%
	M3	5525	24%	586	5%	1171	10%	878	8%	4939	19%	4354	14%	4647	17%
	L4a	45	0%	0	0%	0	0%	0	0%	45	0%	45	0%	45	0%
	L4b	992	4%	1757	15%	3513	30%	2635	23%	-765	-11%	-2521	-26%	-1643	-18%
	L5b	0		586	5%	1405	12%	995	9%	-586	-5%	-1405	-12%	-995	-9%
Total		11711	100%	8783	75%	15458	132%	12121	104%						
NORTH	**E1g**	1924	2%	1538	15%	2153	21%	1845	18%	386	-13%	-229	-19%	79	-16%
Mud Springs Creek	**E1s**	5479	70%	3588	35%	5023	49%	4305	42%	1891	35%	456	21%	1174	28%
	M2	2198	21%	0	0%	1025	10%	513	5%	2198	21%	1173	11%	1686	16%
	M3	530	5%	513	5%	1025	10%	769	8%	18	0%	-495	-5%	-239	-2%
	L4a	104	1%	0	0%	0	0%	0	0%	104	1%	104	1%	104	1%
	L4b	16	0%	1538	15%	3075	30%	2307	23%	-1522	-15%	-3060	-30%	-2291	-22%
	L5b	0		513	5%	1230	12%	871	9%	-513	-5%	-1230	-12%	-871	-9%
Total		10251	100%	7688	75%	13532	132%	10610	104%						
PENNINSULA	**E1g**	154		252	15%	353	21%	302	18%	-98	-15%	-199	-21%	-148	-18%
Crooked River Grasslands	**E1s**	1083	56%	588	35%	823	49%	706	42%	495	21%	260	7%	377	14%
	M2	106	5%	0	0%	168	10%	84	5%	106	5%	-62	-5%	22	0%
	M3	337	15%	84	5%	168	10%	126	8%	253	10%	169	5%	211	8%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		252	15%	504	30%	378	23%	-252	-15%	-504	-30%	-378	-23%
	L5b	0		84	5%	202	12%	143	9%	-84	-5%	-202	-12%	-143	-9%
Total		1680	100%	1260	75%	2218	132%	1739	104%						
ROUND BUTTE	**E1g**	308		374	15%	524	21%	449	18%	-66	-15%	-216	-21%	-141	-18%
Deschutes South	**E1s**	825		873	35%	1222	49%	1048	42%	-48	10%	-397	-4%	-223	3%
	M2	1004	40%	0	0%	249	10%	125	5%	1004	40%	755	30%	879	35%
	M3	357	14%	125	5%	249	10%	187	8%	233	9%	108	4%	170	7%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		374	15%	748	30%	561	23%	-374	-15%	-748	-30%	-561	-23%

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
	L5b	0		125	5%	299	12%	212	9%	-125	-5%	-299	-12%	-212	-9%
Total		2494	100%	1871	75%	3293	132%	2582	104%						
RUSH	**E1g**	1255		975	15%	1364	21%	1169	18%	280	-15%	-109	-21%	86	-18%
Willow Creek	**E1s**	3130	68%	2274	35%	3184	49%	2729	42%	856	33%	-54	19%	401	26%
	M2	1263	19%	0	0%	650	10%	325	5%	1263	19%	613	9%	938	14%
	M3	849	13%	325	5%	650	10%	487	8%	524	8%	199	3%	362	6%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		975	15%	1949	30%	1462	23%	-975	-15%	-1949	-30%	-1462	-23%
	L5b	0		325	5%	780	12%	552	9%	-325	-5%	-780	-12%	-552	-9%
Total		6497	100%	4873	75%	8576	132%	6724	104%						
STEER	**E1g**	783		344	15%	481	21%	412	18%	439	-15%	302	-21%	371	-18%
Willow Creek	**E1s**	1508	100%	802	35%	1123	49%	962	42%	706	65%	385	51%	546	58%
	M2	0	0%	0	0%	229	10%	115	5%	0	0%	-229	-10%	-115	-5%
	M3	0		115	5%	229	10%	172	8%	-115	-5%	-229	-10%	-172	-8%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		344	15%	687	30%	515	23%	-344	-15%	-687	-30%	-515	-23%
	L5b	0		115	5%	275	12%	195	9%	-115	-5%	-275	-12%	-195	-9%
Total		2291	100%	1718	75%	3024	132%	2371	104%						
WEANING	**E1g**	0		36	15%	50	21%	43	18%	-36	-15%	-50	-21%	-43	-18%
Willow Creek	**E1s**	238	100%	83	35%	116	49%	100	42%	154	65%	121	51%	138	58%
	M2	0		0	0%	24	10%	12	5%	0	0%	-24	-10%	-12	-5%
	M3	0		12	5%	24	10%	18	8%	-12	-5%	-24	-10%	-18	-8%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		36	15%	71	30%	53	23%	-36	-15%	-71	-30%	-53	-23%
	L5b	0		12	5%	29	12%	20	9%	-12	-5%	-29	-12%	-20	-9%
Total		238	100%	178	75%	314	132%	246	104%						
WILLIAMS	**E1g**	35	3%	184	15%	257	21%	220	18%	-149	-12%	-222	-18%	-185	-15%
Whychus	**E1s**	424	33%	428	35%	600	49%	514	42%	-4	-2%	-176	-16%	-90	-9%
	M2	765	63%	0	0%	122	10%	61	5%	765	63%	643	53%	704	58%
	M3	0		61	5%	122	10%	92	8%	-61	-5%	-122	-10%	-92	-8%
	L4a	0		0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	L4b	0		184	15%	367	30%	275	23%	-184	-15%	-367	-30%	-275	-23%
	L5b	0		61	5%	147	12%	104	9%	-61	-5%	-147	-12%	-104	-9%
Total		1224	100%	918	75%	1616	132%	1267	104%						
Cotter Pond		197													
Devine		80													

CRNG COVER (SERAL) TYPE DATA															
		EXISTING		HISTORICAL RANGE OF VARIABILITY						DIFFERENCE					
				LOW		HIGH		AVERAGE		LOW		HIGH		AVERAGE	
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
Grand Total		102939													

<u>Appendix D</u> Estimated Outputs by alternative (within Grassland Allotments)

This table displays the expected outputs under each alternative. Outputs are displayed for Grassland owned lands only.

VEGETATION TREATMENTS/GRAZING DISPOSITION		ALTERNATIVES			
		Alt A	Alt B	Alt C	Alt D
Acres of Juniper Density Control - chainsaw		0	0	27,095	10,803
Acres of Juniper Density Control - chainsaw/prescribe fire		0	0	5,196	5,1956
Acres of Sagebrush/Juniper cover control - prescribe fire/mechanical		0	0	7,999	5,246
Acres of Juniper Control as part of seeding treatments - chainsaw		0	0	8,344	8,344
	Total Acres of Juniper Control	0	0	48,633	29,588
	Total Acres of Till/Seed/Fertilize	0	0	8,344	8,344
	Total Acres of Vegetation Treatment	0	0	48,633	29,588
Acres Open to Domestic Livestock Grazing		0	102,938	82,923	88,085
Acres Vacant to Domestic Livestock Grazing		0	0	0	1,592
Acres Closed to Domestic Livestock Grazing		102,938	0	8,233	13,261
Acres in Forage Reserve		0	0	11,782	0
Total Acres		102,938	102,938	102,938	102,938

<u>Appendix E</u> Alternative C. & D. Vegetation Treatment Project Descriptions

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
6	25	0.75	19	blanchard	outside	l4a	l4b	l5b	cs	cut young (less 10' tall) juni, lop and scatter
10	179	0.5	90	juniper_butte	n_osborne	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
16	71	1	71	blanchard	juniper_sp	l4a	l4b	l5b	cs	using cs thin young juni, lop and scatter
30	132	1	132	cyrus	w_cyrus	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
31	168	1	168	cyrus	trail_crossing	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
32	387	1	387	cyrus	w_cyrus	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
33	269	1	269	juniper(hs)	s_haystack	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
34	389	1	389	rush	w_coyote	m3	m3	l4b	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
35	251	1	251	juniper_butte	juniper_butte	m3	m3	l4b	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
37	337	0.75	253	juniper_butte	hiway	m2	m2	m3	cs	cut juni and lop and scatter
40	439	0.5	219	juniper(hs)	e_osborne	e1s	e1s	e1s	cs	maintain artr steppe by cutting less than 9" juni, lop and scatte
41	167	0.5	84	juniper_butte	cabin	e1s	e1s	e1s	cs	maintain artr steppe by cutting less than 9" juni, lop and scatte
50	222	0.75	167	williams	williams	m2	e1s	e1s	cs	cut juni and lop and scatter
51	164	0.75	123	holmes-squaw_cr	holmes	m2	e1s	e1s	cs	cut juni and lop and scatter
53	343	0.75	258	holmes-squaw_cr	squaw_cr	m2	e1s	e1s	cs	cut juni and lop and scatter
54	206	0.75	154	holmes-squaw_cr	squaw_cr	m2	e1s	e1s	cs	cut juni and lop and scatter
55	270	1	270	north	e_corral	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
55	409	1	409	north	e_corral	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
56	252	1	252	north	n_schmo	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
					ker					
57	740	1	740	north	s_schmoker	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
58	887	1	887	fox	n_fox	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
59	963	1	963	blanchard	w_willow	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
60	818	1	818	blanchard	n_willow	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
61	308	1	308	round_butte	n_microwave	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
62	168	1	168	round_butte	canyon	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
63	1038	1	1038	lone_pine	scales	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
64	509	1	509	grizzly	s_weigand	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
65	238	1	238	cyrus	w_cyrus	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
66	454	1	454	juniper_butte	w_haystack	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
69	218	1	218	cyrus	trail_crossing	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
70	73	1	73	cyrus	trail_crossing	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
72	483	1	483	lone_pine	w_jap_cr	m3	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
73	199	1	199	lone_pine	lone_pine	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
74	498	1	498	blanchard	s_blanchard	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
75	1030	1	1030	blanchard	middle	e1s/m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
76	812	0.5	406	goldmine/falls	goldmine/falls	m2/m3/e1s	m2/m3	m2/m3	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
77	889	1	889	rush	w_coyote	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
78	634	1	634	peninsula	south	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
79	592	1	592	peninsula	north	e1s/m2/m	e1s/m2/m3	e1s/l4b	cs	maintenance cut, cs cut 100% of juni <12" butt diameter

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
						3				
80	538	1	538	round_butte	w_mt_view	e1s/m2/m3	e1s/m2/m3	e1s/l4b	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
82	892	1	892	off	off	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
83	730	1	730	kennedy	kennedy	e1s	e1s	e1s	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
84	1765	0.5	883	lower_desert	lower_desert	e1s/m2/m3/l4a	e1s/m2/m3/l4a	m2/m3/l4a/l5	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
85	1155	1	1155	grizzly	mcmeen	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
86	605	1	605	lone_pine	pine_ridge	m3	m3	l4b	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
87	547	1	547	blanchard	juniper_sp	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
88	572	1	572	fox	n_willow	e1s/m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
89	641	1	641	fox	n_willow	m2/m3/e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
90	465	1	465	fox	dump	e1s/m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
91	923	1	923	steer	e_w_alexander	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
92	1095	1	1095	cyrus	e_cyrus	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
93	936	1	936	rush	e_coyote	m2/e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
	27095								**cs Total**	
3	621	0.5	310	north	w_parkey	m2	e1g/e1s/m2	e1s/m3	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
4	319	1	319	fox	suicide	m2	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
5	229	0.5	114	fox	reichen	e1s	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
14	880	0.33	291	blanchard	bennett_sp	m2	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
22	562	1	562	lone_pine	e_jap_cr	m3	e1g/e1s/m3	e1s/l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
23	156	0.5	78	lone_pine	l_pineridge	m3	e1g/e1s/m3	e1s/l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
47	1002	0.75	751	lower_desert	dry_lake	m3	m3	l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
48	1170	0.75	877	lower_desert	geneva	m3	m3	l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
52	257	0.75	193	holmes-squaw_cr	holmes	m2	e1g/m2	e1s/m3	cs_rxfire	cut juni, lop and scatter, apply cool rxfire in 2-4 years
	5196								**cs_rxfire Total**	
7	712	0.5	356	steer	n_boyce	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
8	684	0.5	342	steer	s_boyce	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
11	886	0.5	443	boyce	m_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
12	739	0.5	370	boyce	n_healy	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
24	272	0.33	90	lone_pine	lone_pine	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
27	758	0.33	250	rush	w_rush	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
28	993	0.5	497	rush	e_rush	e1s	e1g/e1s	e1s	cs_till_seed_f	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
									er	
29	541	1	541	boyce	s_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
36	214	0.5	107	gorge	n_gorge	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
38	164	0.5	82	juniper_butte	neck	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
39	537	0.5	268	juniper_butte	ditch	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
42	1009	0.5	504	boyce	dayton_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
43	147	0.5	73	fox	reichen	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
44	204	0.5	102	fox	mud_sp	e1g/e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
45	396	0.5	198	north	n_schmoker	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed mix 1, fert (tbd), protect artr,cut juni
46	88	0.75	66	north	w_coburn	m2	e1g	e1s	cs_till_seed_fer	cut juni use as rip rap in channel, seed with seed mix 2, fert
	8344								**cs_till_seed_fer Total**	

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
17	74	1	74	round_butte	s_microwave	e1s	e1g	e1s	mech	using mech method cut brush to creat fuel break
18	38	1	38	round_butte	n_microwave	e1s	e1g	e1s	mech	using mech method cut brush to creat fuel break
19	245	1	245	round_butte	outside	m3	m3	m3	mech	using mech method cut brush to creat fuel break
20	45	1	45	round_butte	w_observatory	m3	m3	m3	mech	using mech method cut brush to creat fuel break
21	86	0.33	29	round_butte	e_observatory	m2	m2	m3	mech	using mech method cut brush to creat fuel break
	488								**mech Total**	
1	813	0.5	406	north	e_coburn	e1s	e1g/e1s	e1s	rxfire	mosaic, winter/spr. fire, reduce artr canopy and control juni
2	582	0.5	291	north	s_schmoker	e1s/m2	e1g/e1s/m2	e1s/m3	rxfire	control juni, lve artr pockets/juni clumps
9	510	0.5	255	north	north	e1s	e1g/e1s	e1s	rxfire	mosaic, winter/spr. fire, reduce artr canopy and control juni
13	663	0.5	331	blanchard	juniper_sp	e1s	e1g/e1s	e1s	rxfire	moasic, rxfire control artr canopy and juni
15	928	0.33	306	blanchard	juniper_sp	e1s	e1g/e1s	e1s	rxfire	moasic, cool rxfire control artr canopy and juni
25	321	0.33	106	lone_pine	mccoin	m2	e1g/m2	e1s/m3	rxfire	create moasic using rxfire
26	414	0.25	104	cyrus	cyrus_hill	m2	e1g/m2	e1s/m3	rxfire	create moasic using rxfire
49	526	0.75	394	peninsula	middle	e1s	e1g/e1s	e1s	rxfire	winter/spring cool rxfire to reduce shrub canopy
67	1752	0.33	876	holmes/sqcr	squaw_cr	e1s/m2	e1g/e1s/m2	e1s/m3	rxfire	create moasic using rxfire
68	639	0.5	320	clevenger	clevenger	m2/m3	e1g/m2/m3	e1s/m3/l4b	rxfire	create moasic using rxfire
81	362	1	362	round_butte	e_mt_view	e1s/m2	e1g	e1s	rxfire	create moasic using rxfire

VEGETATION TREATMENTS FOR ALTERNATIVE C.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	TREATEMENT COMMENTS
	7510								**rxfire Total**	
	48633								**Grand Total**	

VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
6	25	0.75	19	blanchard	outside	l4a	l4b	l5b	cs	cut young (less 10' tall) juni, lop and scatter
10	179	0.5	90	juniper_butte	n_osborne	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
16	71	1	71	blanchard	juniper_sp	l4a	l4b	l5b	cs	using cs thin young juni, lop and scatter
30	132	1	132	cyrus	w_cyrus	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
31	168	1	168	cyrus	trail_crossing	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
32	387	1	387	cyrus	w_cyrus	m3	m3	l4b	cs	thin juni to 100 plus spacing, lop and scatter
33	269	1	269	juniper(hs)	s_haystack	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
34	389	1	389	rush	w_coyote	m3	m3	l4b	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
35	251	1	251	juniper_butte	juniper_butte	m3	m3	l4b	cs	thin young juni to 200 spacing, lop and scatter, leaving juni clu
37	337	0.75	253	juniper_butte	hiway	m2	m2	m3	cs	cut juni and lop and scatter
40	439	0.5	219	juniper(hs)	e_osborne	e1s	e1s	e1s	cs	maintain artr steppe by cutting less than 9" juni, lop and scatte
41	167	0.5	84	juniper_butte	cabin	e1s	e1s	e1s	cs	maintain artr steppe by cutting less than 9" juni, lop and scatte
50	222	0.75	167	williams	williams	m2	e1s	e1s	cs	cut juni and lop and scatter
51	164	0.75	123	holmes-squaw_cr	holmes	m2	e1s	e1s	cs	cut juni and lop and scatter
53	343	0.75	258	holmes-squaw_cr	squaw_cr	m2	e1s	e1s	cs	cut juni and lop and scatter
54	206	0.75	154	holmes-squaw_cr	squaw_cr	m2	e1s	e1s	cs	cut juni and lop and scatter

VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
55	270	1	270	north	e_corral	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
55	409	1	409	north	e_corral	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
56	252	1	252	north	n_schmoker	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
57	740	1	740	north	s_schmoker	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
58	887	1	887	fox	n_fox	m2	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
59	963	1	963	blanchard	w_willow	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
60	818	1	818	blanchard	n_willow	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
61	308	1	308	round_butte	n_microwave	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
62	168	1	168	round_butte	canyon	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
63	1038	1	1038	lone_pine	scales	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
64	509	1	509	grizzly	s_weigand	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
65	238	1	238	cyrus	w_cyrus	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
66	454	1	454	juniper_butte	w_haystack	e1s	e1s	e1s	cs	maintenance cut, cs cut 100% of juni <12" butt diameter
	10803								**cs Total**	
3	621	0.5	310	north	w_parkey	m2	e1g/e1s/m2	e1s/m3	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire

VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
4	319	1	319	fox	suicide	m2	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
5	229	0.5	114	fox	reichen	e1s	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
14	880	0.33	291	blanchard	bennett_sp	m2	e1g/e1s	e1s	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
22	562	1	562	lone_pine	e_jap_cr	m3	e1g/e1s/m3	e1s/l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
23	156	0.5	78	lone_pine	l_pineridge	m3	e1g/e1s/m3	e1s/l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
47	1002	0.75	751	lower_desert	dry_lake	m3	m3	l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
48	1170	0.75	877	lower_desert	geneva	m3	m3	l4b	cs_rxfire	mosaic, cut juni, lop.,scatter,2_3 yr cool rxfire
52	257	0.75	193	holmes-squaw_cr	holmes	m2	e1g/m2	e1s/m3	cs_rxfire	cut juni, lop and scatter, apply cool rxfire in 2-4 years
	5196								**cs_rxfire Total**	
7	712	0.5	356	steer	n_boyce	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
8	684	0.5	342	steer	s_boyce	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
11	886	0.5	443	boyce	m_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
12	739	0.5	370	boyce	n_healy	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni

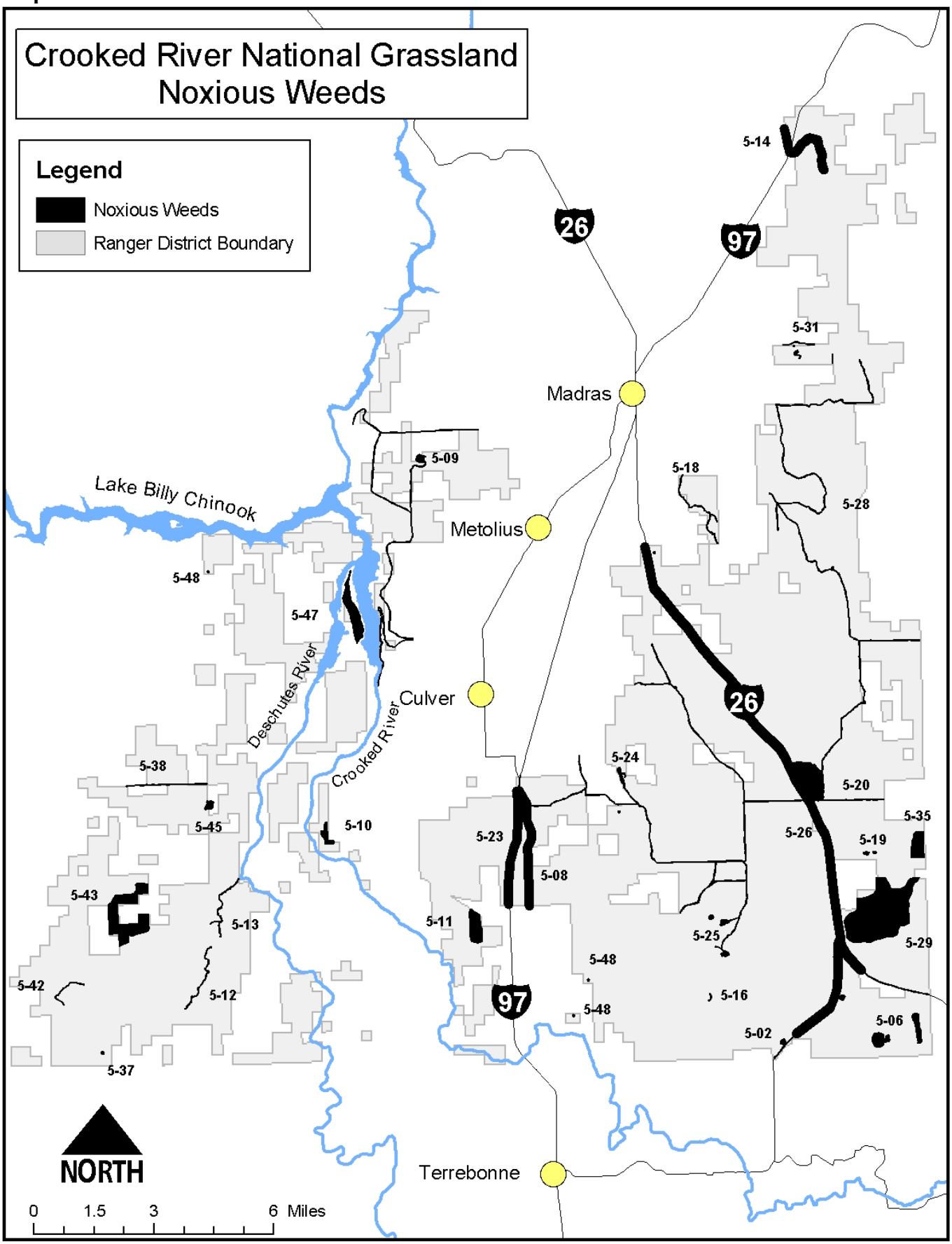
VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
24	272	0.33	90	lone_pine	lone_pine	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
27	758	0.33	250	rush	w_rush	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
28	993	0.5	497	rush	e_rush	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
29	541	1	541	boyce	s_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
36	214	0.5	107	gorge	n_gorge	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
38	164	0.5	82	juniper_butte	neck	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
39	537	0.5	268	juniper_butte	ditch	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
42	1009	0.5	504	boyce	dayton_grant	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
43	147	0.5	73	fox	reichen	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
44	204	0.5	102	fox	mud_sp	e1g/e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni
45	396	0.5	198	north	n_schmoker	e1s	e1g/e1s	e1s	cs_till_seed_fer	mosaic, till to 7-10", seed with mix 1, fert (tbd), protect artr,cut juni

VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
46	88	0.75	66	north	w_coburn	m2	e1g	e1s	cs_till_seed_fer	cut juni use as rip rap in channel, seed with seed mix 2, fert
	8344								**cs_till_seed_fer Total**	
17	74	1	74	round_butte	s_microwave	e1s	e1g	e1s	mech	using mech method cut brush to creat fuel break
18	38	1	38	round_butte	n_microwave	e1s	e1g	e1s	mech	using mech method cut brush to creat fuel break
19	245	1	245	round_butte	outside	m3	m3	m3	mech	using mech method cut brush to creat fuel break
20	45	1	45	round_butte	w_observatory	m3	m3	m3	mech	using mech method cut brush to creat fuel break
21	86	0.33	29	round_butte	e_observatory	m2	m2	m3	mech	using mech method cut brush to creat fuel break
	488								**mech Total**	
1	813	0.5	406	north	e_coburn	e1s	e1g/e1s	e1s	rxfire	mosaic, winter/spr. fire, reduce artr canopy and control juni
2	582	0.5	291	north	s_schmoker	e1s/m2	e1g/e1s/m2	e1s/m3	rxfire	control juni, lve artr pockets/juni clumps
9	510	0.5	255	north	north	e1s	e1g/e1s	e1s	rxfire	mosaic, winter/spr. fire, reduce artr canopy and control juni
13	663	0.5	331	blanchard	juniper_sp	e1s	e1g/e1s	e1s	rxfire	moasic, rxfire control artr canopy and juni
15	928	0.33	306	blanchard	juniper_sp	e1s	e1g/e1s	e1s	rxfire	moasic, cool rxfire control artr canopy and juni
25	321	0.33	106	lone_pine	mccoin	m2	e1g/m2	e1s/m3	rxfire	create moasic using rxfire
26	414	0.25	104	cyrus	cyrus_hill	m2	e1g/m2	e1s/m3	rxfire	create moasic using rxfire
49	526	0.75	394	peninsula	middle	e1s	e1g/e1s	e1s	rxfire	winter/spring cool rxfire to reduce shrub canopy

VEGETATION TREATMENTS FOR ALTERNATIVE D.										
LABEL	ACRES	TREAT PERCENT	TREAT ACRES	ALLOT-MENT	PASTURE	EXISTING SERAL	ESTIMATED SERAL 10 YEARS	ESTIMATED SERAL 30 YEARS	TREAT-MENT	COMMENTS
	4757								**rxfire Total**	
	29588								**Grand Total**	

<u>Appendix F</u> Map Of Noxious Weed Infestations

Map Of Noxious Weed Infestations



<u>Appendix G</u> Noxious Weed Infestations Within The Crooked River National Grassland:

Noxious Weed Infestations Within The Crooked River National Grassland:

Site #	Species	Acres	Density	Location	Treatment History
5-01	Spotted knapweed Diffuse knapweed Russian knapweed	40 1 1	M L H	Road 51	Chemical and manual (handpull) small infestations
5-02	Diffuse knapweed Spotted knapweed	14 14	M M	Hwy 26	Chemical and manual
5-03	Spotted knapweed Diffuse knapweed Russian knapweed	2 1 1	M L H	Road 51	Chemical and manual
5-04	Russian knapweed	1	H	Old Maid's Canyon	Chemical and manual
5-05	Diffuse knapweed Spotted knapweed Medusahead	3 3 100	M M H	N Combs Spring	Chemical and Manual No action
5-06	Medusahead	60	H	Japanese Creek + MS	No action
5-07	Spotted knapweed DalmatianToadflax	2 1	L L	Cyrus Spring area	Chemical and manual
5-08	Spotted knapweed Diffuse knapweed Dalmatian toadflax	6 1 1	M L L	Old Hwy 97 Roadside	Chemical and manual
5-09	Spotted knapweed Diffuse knapweed	22 22	M L	Rd 35 and 6620 including Round Butte MS	Chemical and manual
5-10	Spotted knapweed Diffuse knapweed Scotch thistle	20 1 1	M L L	Rd 6120 and Geneva MS	Chemical and manual
5-11	Spotted knapweed Diffuse knapweed Teasel	1 1 1	L L H	Rd 7210, Gorge Allotment	Chemical and manual
5-12	Diffuse knapweed	4	M	6360 Rd, juniper/sage	Chemical and manual
5-13	Diffuse knapweed Teasel	1 5	L L	Alder Spring /Squaw Creek	Manual
5-14	Spotted knapweed	4	M	Cotter Pond	Chem/Manual
5-15	Medusahead	1	L	Schmoker MS + 5160 RD	No action
5-16	Yellow starthistle*	.1	L	5720-080 road	Chem/Manual
5-17	Spotted knapweed Diffuse knapweed Russian knapweed	4 5 3	L L M	Boyce Corral area + Boyce MS	Chemical and manual
5-18	Canada thistle	2	M	Lower Willow Cr.	No action
5-19	Canada thistle	5	M	Morrow ponds	No action
5-20	Russian knapweed Spotted knapweed Canada thistle	1 1 1	M M M	Rimrock Springs Dam	Chemical and manual
5-21	Spotted knapweed Russian knapweed	5 5	M H	Lone Pine Spring	Chemical and manual
5-22	Spotted knapweed	1	L	Skull Hollow	Chem/Manual
5-23	Spotted knapweed Diffuse knapweed	.1 .1	L L	Hwy 97, Juniper Butte	Chemical and manual
5-24	Diffuse knapweed	.1	L	Haystack CG	Manual

Site #	Species	Acres	Density	Location	Treatment History
	Spotted knapweed Dalmatian toadflax Russian knapweed Canada thistle	.2 .1 3 .2	L M H M		Biological
5-28	Spotted knapweed Diffuse knapweed	.1 .1	L L	Mud Springs 52 Road	Manual
5-29	Medusahead	2500	M	South Grizzly pasture	No action
5-35	Medusahead	100	H	Morrow	No action
5-37	St. Johns wort	0.5	M	Upper Squaw Cr	No action
5-38	Spotted knapweed	8	M	Grandview cemetery	Manual
5-39	Medusahead Spotted knapweed	50 5	H H	West Side Geneva	Chemical and manual
5-40	Canada thistle	1	M		No action
5-41	Medusahead	5	M	6360-040 Road	No action
5-42	Spotted knapweed	2	M	Squaw Flat	Manual
5-43	Medusahead	100	H	Squaw Flat	No action
5-44	Spotted knapweed	5	M		Manual
5-45	Spotted knapweed Medusahead	1 1	M L	Geneva Pond	No action
5-46	Spotted knapweed Canada thistle	1 1	M M	Weigand Spring	Manual
5-47	Medusahead	1	L	The Island RNA	Manual
5-50	Medusahead	110	M	East Buck Butte	No action

* Small infestation that may have been eradicated

Fire/Herb/Cultural = Prescribed fire to reduce seed production and prepare site for herbicide, followed by broadcast seeding of competitive vegetation

Man/Herb = Manual/Herbicide Treatment: Hand pull small infestations less than 10 plants, use herbicides on larger infestations

Density: L=1-5% cover, M=6-25%, H=26-100%

<u>Appendix H</u> Noxious Weed Risk Risk Factors, By Alternative

Noxious Weed Risk Risk Factors, By Alternative

This checklist determines the level of risk associated with an activity in the introduction and spread of Oregon State listed noxious weeds. Elements of risk are rated as high, moderate or low. Each activity included in the CRNG – EIS project or reasonably foreseeable activities is checked, and then summarized into a risk ranking.

Project: Crooked River National Grassland Vegetation Management EIS –

Alternative A

Risk Factors and Vectors:

Category 1. Disturbance – Creating of Bare Soil

Disturbance of Weed Infestation(s)

High Risk =

___ Pile burning adjacent to major travel routes or known weed locations
___ Prescribed burning adjacent to or within known weed infestations of high risk* (eg medusahead)
___ Culvert replacement along a major travel route
___ Road closures (berms, ripping) if adjacent to known weed populations
___ Skid roads, if adjacent to known weed populations
___ Timber harvest landings
___ Large woody material placement keyed in to the bank, within or adjacent to known weed locations
___ Stream channel reconstruction
___ Headcut repair within or adjacent to known weed locations
___ Road construction, including new, temp, re-construction

*Depending on weed species, this may be moderate risk factor

Moderate Risk =

___ Road re-use (disturbing a previously vegetated road)
_X_ Large woody material placement not within the vicinity of known weed locations
___ Skid roads intersecting major travel routes
___ Culvert replacement not along a major travel route

Low Risk =

___ Skid roads not adjacent to known weed populations or coming off main roads
_X_ Prescribed burning not adjacent to or within known weed population
___ Large woody material placement not keyed into bank or near known weed locations
___ Pile burning not adjacent to main roads or known weed locations
___ Headcut repair not within the vicinity known weed locations
___ Road closures not adjacent to main roads or known weed populations

Category 2. Heavy Equipment Use

High Risk =

_ _ Heavy equipment use adjacent to high-risk weed infestations (e.g. medusahead)

___ Log haul on roads with known weed populations
_X_ Boulder, soil and woody material collection and transport

Moderate Risk =

___ Log haul
_X_ Road maintenance

Low Risk** =
___ Harvest equipment
___ Grapple piling with skidder, excavator, etc.
___ Large woody material placement using spyder or excavator
___ Road construction, reconstruction
___ Road closures
___ Culvert replacement equipment: excavator, bulldozers, backhoe, etc.
** Rated as low risk due to contract clauses requiring clean equipment be used for all contracts.

Category 3. Other Activities

High Risk =
_X_ Off-road vehicle use within a noxious weed infestation
___ Cattle grazing within or moving from areas with known weed infestations
___ Recreation – hiking, mountain bike or horseback riding within a weed infestation

Moderate Risk =
_X_ Recreation – hiking, mountain bike or horseback riding
_X_ Dispersed camping
_X_ Off-road vehicle use
_X_ Public vehicle use
_X_ Agency vehicle use

Low Risk =
___ Cattle grazing within weed free areas
___ Fence construction and maintenance
___ Re-vegetation activities that do not involve heavy equipment

Risk Ranking:
The project is considered to be at high risk for weed introduction and spread if any high risk factors from Categories 1, 2 or 3 are part of the project design. A combination of three or more moderate risk factors from Categories 1 or 2 is also considered high risk.

The project is considered to be at moderate risk for weed introduction and spread if two moderate risk factors from Categories 1 or 2 are part of the project design. A combination of one moderate risk factor from Categories 1 or 2 plus a high risk factor from Category 3 is also considered moderate risk.

The project is considered to be at low risk for weed introduction and spread if one moderate risk factor is part of the project design.

Notes on Category 3: Some weed dispersal vectors, such as those from Category 3, are inherent risks from managing public land open to all forms of travel, use and recreation. Some of these vectors may be out of the scope of the proposed project. Professional judgment is necessary in assessing the impact to individual projects, and determining whether the risk ranking should be increased. At a minimum these vectors should be considered in cumulative effects analysis if appropriate.

Risk Ranking: HIGH (due to other activities)

Alternative A (no action) includes no grazing, vegetation management, or fuels treatments that would increase risk for introduction and spread of noxious weeds. However, reasonably foreseeable activities, such as continued vehicle use, road maintenance, and mineral material (quarry) activities will likely result in introduction and spread of weeds. These activities are checked in the following chart. Therefore, this alternative ranks HIGH for risk of introduction and spread of noxious weeds.

Alternative B

Risk Factors and Vectors:

Category 1. Disturbance – Creating of Bare Soil
Disturbance of Weed Infestation(s)

High Risk =

___ Pile burning adjacent to major travel routes or known weed locations
___ Prescribed burning adjacent to or within known weed infestations of high risk* (eg.medusahead)
___ Culvert replacement along a major travel route
___ Road closures (berms, ripping) if adjacent to known weed populations
___ Skid roads, if adjacent to known weed populations
___ Timber harvest landings
___ Large woody material placement keyed in to the bank, within or adjacent to known weed locations
___ Stream channel reconstruction
___ Headcut repair within or adjacent to known weed locations
___ Road construction, including new, temp, re-construction

*Depending on weed species, this may be moderate risk factor

Moderate Risk =

___ Road re-use (disturbing a previously vegetated road)
_X_ Large woody material placement not within the vicinity of known weed locations
___ Skid roads intersecting major travel routes
___ Culvert replacement not along a major travel route

Low Risk =

___ Skid roads not adjacent to known weed populations or coming off main roads
_X_ Prescribed burning not adjacent to or within known weed population
___ Large woody material placement not keyed into bank or near known weed locations
___ Pile burning not adjacent to main roads or known weed locations
___ Headcut repair not within the vicinity known weed locations
___ Road closures not adjacent to main roads or known weed populations

Category 2. Heavy Equipment Use

High Risk =

_ _ Heavy equipment use adjacent to high-risk weed infestations (e.g. medusahead)
___ Log haul on roads with known weed populations
_X_ Boulder, soil and woody material collection and transport

Moderate Risk =

___ Log haul
_X_ Road maintenance

Low Risk** =
___ Harvest equipment
___ Grapple piling with skidder, excavator, etc.
___ Large woody material placement using spyder or excavator
___ Road construction, reconstruction
___ Road closures
___ Culvert replacement equipment: excavator, bulldozers, backhoe, etc.
** Rated as low risk due to contract clauses requiring clean equipment be used for all contracts.

Category 3. Other Activities

High Risk =
_X_ Off-road vehicle use within a noxious weed infestation
_X_ Cattle grazing within or moving from areas with known weed infestations
___ Recreation – hiking, mountain bike or horseback riding within a weed infestation

Moderate Risk =
_X_ Recreation – hiking, mountain bike or horseback riding
_X_ Dispersed camping
_X_ Off-road vehicle use
_X_ Public vehicle use
_X_ Agency vehicle use

Low Risk =
_X_ Cattle grazing within weed free areas
_X_ Fence construction and maintenance
___ Re-vegetation activities that do not involve heavy equipment

Risk Ranking: HIGH

This alternative would continue grazing at current levels, exposing soils and increasing noxious weed risk. Livestock grazing would continue. Depending on funding, up to 3,000 acres of western juniper reduction would occur. Other reasonably foreseeable activities, such as vehicle use in and near weed infestations road maintenance, and mineral material site (quarry) activities would continue. This alternative therefore has a HIGH ranking.

Alternative C

Risk Factors and Vectors:
Category 1. Disturbance – Creating of Bare Soil
Disturbance of Weed Infestation(s)
High Risk =
___ Pile burning adjacent to major travel routes or known weed locations
___ Prescribed burning adjacent to or within known weed infestations of high risk* (eg medusahead)
___ Culvert replacement along a major travel route
___ Road closures (berms, ripping) if adjacent to known weed populations
___ Skid roads, if adjacent to known weed populations
___ Timber harvest landings

___ Large woody material placement keyed in to the bank, within or adjacent to known weed locations
___ Stream channel reconstruction
___ Headcut repair within or adjacent to known weed locations
___ Road construction, including new, temp, re-construction
*Depending on weed species, this may be moderate risk factor

Moderate Risk =
___ Road re-use (disturbing a previously vegetated road)
_X_ Large woody material placement not within the vicinity of known weed locations
___ Skid roads intersecting major travel routes
___ Culvert replacement not along a major travel route

Low Risk =
___ Skid roads not adjacent to known weed populations or coming off main roads
_X_ Prescribed burning not adjacent to or within known weed population
___ Large woody material placement not keyed into bank or near known weed locations
_X_ Pile burning not adjacent to main roads or known weed locations
___ Headcut repair not within the vicinity known weed locations
___ Road closures not adjacent to main roads or known weed populations

Category 2. Heavy Equipment Use

High Risk =
_X_ Heavy equipment use adjacent to high-risk weed infestations (e.g. medusahead)
___ Log haul on roads with known weed populations
_X_ Boulder, soil and woody material collection and transport

Moderate Risk =
___ Log haul
_X_ Road maintenance

Low Risk** =
___ Harvest equipment
___Grapple piling with skidder, excavator, etc.
___ Large woody material placement using spyder or excavator
___ Road construction, reconstruction
___ Road closures
___ Culvert replacement equipment: excavator, bulldozers, backhoe, etc.
** Rated as low risk due to contract clauses requiring clean equipment be used for all contracts.

Category 3. Other Activities

High Risk =
_X_ Off-road vehicle use within a noxious weed infestation
_X_ Cattle grazing within or moving from areas with known weed infestations
___ Recreation – hiking, mountain bike or horseback riding within a weed infestation

Moderate Risk =

_X_ Recreation – hiking, mountain bike or horseback riding
_X_ Dispersed camping
_X_ Off-road vehicle use
_X_ Public vehicle use
_X_ Agency vehicle use

Low Risk =
_X_ Cattle grazing within weed free areas
_X_ Fence construction and maintenance
_X_ Re-vegetation activities that do not involve heavy equipment

Risk Ranking: HIGH

This alternative includes activities that could expose soils and increase risk of noxious weeds. Livestock grazing would continue. Reasonably foreseeable activities include vehicle use in and near noxious weed infestations, mineral material site (quarry) activities, seeding, and juniper and fuels treatments. Therefore, this alternative has a HIGH ranking.

Alternative D

High Risk =
Risk Factors and Vectors:
Category 1. Disturbance – Creating of Bare Soil
Disturbance of Weed Infestation(s)
High Risk =
___ Pile burning adjacent to major travel routes or known weed locations
___ Prescribed burning adjacent to or within known weed infestations of high risk* (eg medusahead)
___ Culvert replacement along a major travel route
___ Road closures (berms, ripping) if adjacent to known weed populations
___ Skid roads, if adjacent to known weed populations
___ Timber harvest landings
___ Large woody material placement keyed in to the bank, within or adjacent to known weed locations
___ Stream channel reconstruction
___ Headcut repair within or adjacent to known weed locations
___ Road construction, including new, temp, re-construction
*Depending on weed species, this may be moderate risk factor

Moderate Risk =
___ Road re-use (disturbing a previously vegetated road)
_X_ Large woody material placement not within the vicinity of known weed locations
___ Skid roads intersecting major travel routes
___ Culvert replacement not along a major travel route

Low Risk =
___ Skid roads not adjacent to known weed populations or coming off main roads
_X_ Prescribed burning not adjacent to or within known weed population
___ Large woody material placement not keyed into bank or near known weed locations
_X_ Pile burning not adjacent to main roads or known weed locations
___ Headcut repair not within the vicinity known weed locations
___ Road closures not adjacent to main roads or known weed populations

Category 2. Heavy Equipment Use

High Risk =
___ Heavy equipment use adjacent to high-risk weed infestations (e.g. medusahead)
___ Log haul on roads with known weed populations
_X_ Boulder, soil and woody material collection and transport

Moderate Risk =
___ Log haul
_X_ Road maintenance

Low Risk** =
___ Harvest equipment
___ Grapple piling with skidder, excavator, etc.
___ Large woody material placement using spyder or excavator
___ Road construction, reconstruction
___ Road closures
___ Culvert replacement equipment: excavator, bulldozers, backhoe, etc.
** Rated as low risk due to contract clauses requiring clean equipment be used for all contracts.

Category 3. Other Activities

High Risk =
_X_ Off-road vehicle use within a noxious weed infestation
_X_ Cattle grazing within or moving from areas with known weed infestations
___ Recreation – hiking, mountain bike or horseback riding within a weed infestation

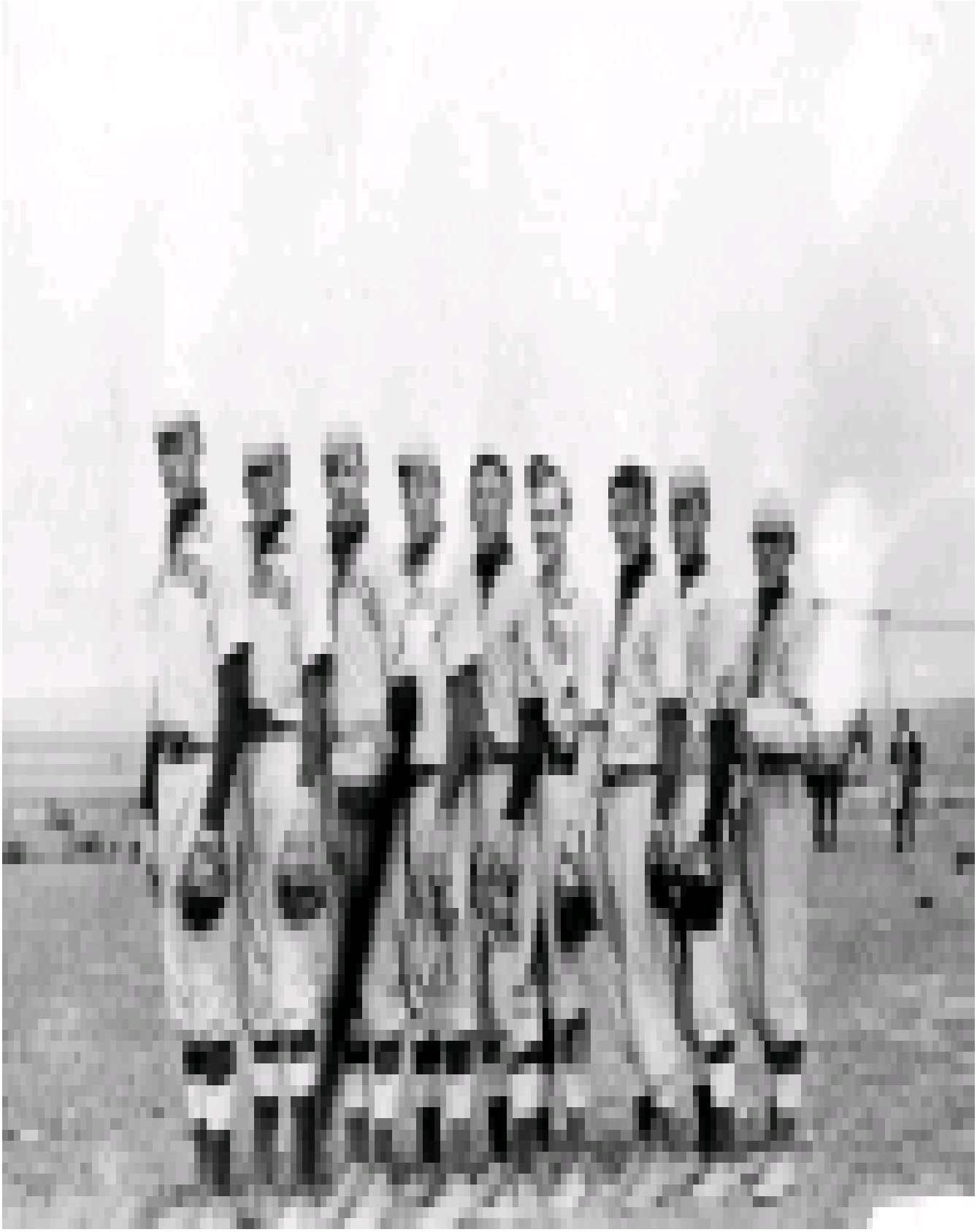
Moderate Risk =
_X_ Recreation – hiking, mountain bike or horseback riding
_X_ Dispersed camping
_X_ Off-road vehicle use
_X_ Public vehicle use
_X_ Agency vehicle use

Low Risk =
_X_ Cattle grazing within weed free areas
_X_ Fence construction and maintenance
_X_ Re-vegetation activities that do not involve heavy equipment

Risk Ranking: HIGH

This alternative includes activities that could expose soils and increase risk of noxious weeds. Livestock grazing would continue. Reasonably foreseeable activities include vehicle use in and near noxious weed infestations, mineral material site (quarry) activities, seeding, and juniper and fuels treatments. Therefore, this alternative has a HIGH ranking.

<u>Appendix I</u> Noxious Weed Prevention Measures



Noxious Weed Prevention Measures
Prevention measures specific to the crooked river national grassland vegetation management environmental impact statement

Noxious Prevention measures (design elements) not considered feasible for this project:

Action	Efficacy	Discussion
Clean all equipment operating in weed sites before leaving the project area	POOR	Project design includes no operations in weed-infested areas. However, some small, scattered infestations may go unnoticed. On these sites, it would be difficult to determine if equipment was in contact with an infested area (especially weeds in the soil seed bank), where plants had been pulled or sprayed. Very costly and difficult to implement.
Workers should inspect clothing and equipment for weed seed ands remove and dispose of properly	LOW	Technical challenge of weed seed identification is high and requires expertise and microscopes. Infeasible to train workers to recognize weed seed
Inspect and document all limited term ground disturbing operations in weed infested areas for at least 3(up to 5) growing seasons following the project	POOR	Because weed sites are major travel ways numerous small disturbances occur in these areas. Area can be inspected throughout growing season but not after each disturbance
Encourage livestock permittees to maintain weed free feedlots and parking and staging areas.	POOR	Would require contacting numerous people, effectiveness would probably be limited.

Noxious Prevention measures considered feasible and incorporated as project design elements:

Action	Efficacy	Discussion
Conduct a weed ID workshop for Forest Service personnel involved in the project	HIGH	Ongoing
Avoid or minimize disturbance within existing infestations	MEDIUM	High risk areas have been omitted during project design. Staging areas can be located in weed free areas.
Water for prescribed or wildfire control, watering roads, or other activities would be obtained from weed-free sites	HIGH	Ongoing
Inform and include Grassland weed coordinator with project planning and implementation	HIGH	Ongoing
Following tilling/seeding projects, rest pastures from grazing for a minimum of two years	HIGH	Would be implemented
When cause/effect relationship is established between grazing and weeds, close pastures or portions thereof until infestations are controlled	HIGH	Weed-infested pastures have been identified
Mineral material (i.e. gravel) used for reinforcement around troughs or ponds would come from weed-free	HIGH	Material sites would be inspected prior to their use

Action	Efficacy	Discussion
sources		
Document weed infestations identified during implementation	HIGH	Ongoing
Maintain an invasive plant inventory and use for project planning and implementation	MEDIUM	Ongoing
Conduct pre and post project monitoring	HIGH	Pre project surveys have been completed
Require certified clean equipment that is free of weed seed and plant parts	HIGH	This is a standard provision on the Ochoco NF/CRNG contracts or authorizations. Prescribed fire vehicles must also be clean.
Require certified weed-free seed for re-vegetation projects	HIGH	This is a standard provision for Ochoco NF/CRNG reseeding projects.

It is feasible to undertake the management actions described above, as these procedures have been a Ochoco NF and Crooked River National Grassland standard for the past few years. Post-treatment monitoring is occurring in similar project areas and survey for undiscovered weed populations is ongoing. Additional design elements, such as training of field personnel to identify noxious weeds, are included in alternatives, and have been implemented in similar project areas. Weed management is consistent with objectives for the CRNG projects.

CRNG Vegetation Management EIS

The CRNG Vegetation Management project has been determined to be a high risk for the introduction and spread of noxious weeds (see the risk assessment in the botanist report). Because the project is a high risk, appropriate prevention measures are necessary to reduce this risk. This appendix tiers directly to the USDA Forest Service "Guide to Noxious Weed Prevention Practices" (USDA Forest Service 2001). Each prevention measure appropriate for the CRNG project is listed, along with the corresponding action taken listed in italics. Design elements refer to measures adopted for all alternatives in the CRNG Vegetation Management EIS.

Required Prevention Measures

For this project, there are no required prevention measures.

Optional Prevention Measures

General Prevention Practices

Goal 1: Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions.
Practice 1: Environmental analysis for projects and maintenance programs will need to assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices. Determine prevention and maintenance needs, to include the use of herbicides, if needed, at the onset of project planning.
Prevention practices are also identified in this appendix.

Goal 2. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

Practice 2. Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in project operating areas and along access routes. Identify what weeds are on site, or within reasonably expected potential invasion vicinity, and do a risk assessment accordingly. Control weeds as necessary.
The CRNG watershed was inventoried for weeds as part of all botany surveys from 1993 through 2002.
Practice 3. After completing "Practice 2" above, to reduce risk of spreading weed infestations, begin project operations in uninfested areas before operating in weed-infested areas.
Noxious weed design element
Practice 4. Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.
Noxious weed design element
Practice 5. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering National Forest System lands; a Forest Officer, in coordination with the Unit Invasive Species Coordinator, needs to approve use of on-Forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway. Seeds and plant parts need to be collected when practical and incinerated. Remove mud, dirt, and plant parts from project equipment before moving it into a project area.

Addressed under #6

Practice 6. Clean all equipment, before leaving the project site, if operating in areas infested with weeds. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and incinerated.
By design, the project avoids treatments in areas associated with noxious weed infestations.
Practice 7. Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.
Not applicable – weed infestations within the CRNG project area are, at this time, not concentrated enough to deposit seed on clothing.
Practice 8. Coordinate project activities with any nearby herbicide application to maximize cost effectiveness of weed treatments.
By design, the project avoids treatments in areas associated with noxious weed infestations.
Practice 9. Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail rights-of-way, and other areas of disturbed soils.
Not applicable to this project

Goal 3. Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor and cooperator operations. For practices 10 through 12 below, work with the responsible transportation agencies to voluntarily adopt these practices where county and state governments have responsibility for maintenance of roads that cross National Forest System lands.
Practice 10. Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.
Noxious weed design element

Practice 11. *Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled.*
Material from weed-infested sources would not be used on this project – noxious weed design element
Practice 12. *Maintain stockpiled, uninfested material in a weed-free condition.*
Material sources are monitored routinely for noxious weeds. Those determined to have weeds are no longer used.

Goal 4. In those vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.
Practice 13. *Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.*
See #14 below

Goal 5. Avoid creating soil conditions that promote weed germination and establishment.
Practice 14. *Minimize soil disturbance to the extent practical, consistent with project objectives.*
Project is designed to reduce densities of native juniper and move vegetation towards more open, bunchgrass plant communities.

Goal 6. Where project disturbance creates bare ground, consistent with project objectives, re-establish vegetation to prevent conditions to establish weeds.
Practice 15. *Re-vegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover re-vegetation.*
By design, project would reseed those sites where establishment of deep-rooted bunchgrasses is intended. Other treated sites, such areas with juniper removal, are expected to seed in naturally.
Practice 16. *Re-vegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. Always use certified materials in areas closed by administrative order; refer to Appendix 3 for a sample closure order. Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings)*
Noxious weed design element
Practice 17. *Use local seeding guidelines to determine detailed procedures and appropriate mixes. To avoid weed-contamination, a certified seed laboratory needs to test each lot against the all-State noxious weed list to Association of Seed Technologists and Analysts (AOSTA) standards, and provide documentation of the seed inspection test. There are plant species not on State and Federal noxious weed lists that the Forest Service would consider non-native invasive weeds. Check State and Federal lists to see if any local weeds need to be added prior to testing. Seed lots labeled as certified weed free at time of sale may still contain some weed seed contamination. Non-certified seed should first be tested before use.*
Noxious weed design element
Practice 18. *Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least three (5) growing seasons following completion of the project. For on-going projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.*
Noxious weed inventory is ongoing. Treatment areas would be monitored along with ongoing weed inventory.

Goal 7. Improve effectiveness of prevention practices through weed awareness and education.
Practice 19. Provide information, training and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread on National Forest System lands, including agency managers, employees, forest workers, permit holders, and recreational visitors. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures.
There is an ongoing noxious weed education for employees. Weed identification materials are available to employees, permittees, and the public.
Practice 20. Provide proficient weed management expertise at each administrative unit. Expertise means that necessary skills are available and corporate knowledge is maintained.
The Crooked River National Grassland range conservationist is the noxious weed coordinator on the Crooked River National Grassland.
Practice 21. Develop incentive programs encouraging weed awareness detection, reporting, and for locating new invaders.

Fire Management

Pre-fire, Pre-incident Training
Goal 1. Improve effectiveness of prevention practices through weed awareness and education.
Fire 1. Increase weed awareness and weed prevention in all fire training.
Not applicable to this project, but discussion of weeds is often included in fire training, such as in the dozer boss training of spring, 2003.
Fire 2. Include weed risk factors and weed prevention practices in Resource Advisor duties on all Incident Management Teams and Burn Rehabilitation Teams.
Addressed under #4
Plans
Goal 2. Improve effectiveness of prevention practices through weed awareness and education.

Goal 3. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

Prescribed Fire

Goal 5. To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules or manage fire as an aid in control of weeds.
Fire 12. Ensure that rental equipment is free of weed seed and propagules before the contracting officers representative accepts it.
This is a Forest Service required prevention measure for all service contracts. See noxious weed design element.
Fire 13. Avoid ignition and burning in areas at high risk for weed establishment or spread due to fire effects. Treat weeds that establish or spread because of unplanned burning of weed infestations.
Noxious weed design element
Fire 14. When possible use staging areas and helibases that are maintained in a weed-free condition.
Noxious weed design element
Fire 15. Pre-inventory project area and evaluate weeds present with regard to the effects on the weed spread relative to the fire prescription.
Weed inventory has occurred on the CRNG since 1994, and is ongoing. Design elements include pre-implementation inventories.

Goal 6. Avoid creating soil conditions that promote weed germination and establishment.
Fire 16. Use appropriate preparation and suppression tactics to reduce disturbances to soil and vegetation.
Project design element for soils. By design, project is intended to modify plant communities and structure.

Fire Rehabilitation

Goal 7. Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.

Forest Vegetation Management
Timber Harvest Operations & Stewardship Contracting

Goal 1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.
Forest Veg 1. Treat weeds on projects used by contractors, emphasizing treatment of weed infestations on existing landings, skid trails, and helibases before activities commence.
With the exception of medusahead, weed infestations are being treated. The Interdisciplinary Team determined that no feasible controls are presently available to the Forest Service for this species. Project design elements includes pre-treatment inventory for weeds. If inventory determines weeds are present and may expand following implementation, the project would be modified or dropped.
Forest Veg 2. Train contract administrators to identify noxious weeds and select lower risk sites for landings and skid trails.
Project design elements include noxious weed training for personnel involved in project implementation.
Forest Veg 3. Encourage operators to maintain weed-free mill yards, equipment parking, and staging areas.
Addressed under #4

Goal 2. To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.

Post Vegetation Management Operations

Goal 3. To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.
Forest Veg 7. Minimize soil disturbance to no more than needed to meet vegetation management objectives. Prevention practices to reduce soil disturbance include, but are not limited to:
Treating fuels in place instead of piling
Minimizing heat transfer to soil in burning
Minimizing fireline construction
Fuels design element (minimize soil scorching). Fireline is rarely constructed during prescribed burning operations on the Crooked River National Grassland.

Goal 4. To prevent favorable conditions for weed establishment, re-establish vegetation on bare ground caused by project disturbance.

Grazing Management

Goal 1. Consider noxious weed prevention and control practices in the management of grazing allotments.
Grazing 1. Include weed prevention practices, inspection and reporting direction, and provisions for inspection of livestock concentration areas in allotment management plans and annual operating instructions for active grazing allotments.
Not applicable. Noxious weeds will be addressed in the allotment management plan revisions scheduled for 2003.
Grazing 2. For each grazing allotment containing existing weed infestations, include prevention practices focused on preventing weed spread and cooperative management of weeds in the annual operating instructions. Prevention practices may include, but are not limited to:

Altering season of use
Exclusion
Activities to minimize potential ground disturbance
Preventing weed seed transportation
Maintaining healthy vegetation
Weed control methods
Revegetation
Inspection
Reporting
Education

Project design element is included for resting pastures following vegetative treatments.

Goal 2. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds. Minimize transport of weed seed into and within allotments.

Grazing 3. If livestock are potentially a contributing factor to seed spread, schedule use by livestock in units with existing weed infestations which are known to be susceptible to spread by livestock, to be prior to seed-set or after seed has fallen.
Grazing 4. If livestock were transported from a weed-infested area, annually inspect and treat allotment entry units for new weed infestations.
Surveying entire allotments for noxious weeds every year is not practical or cost effective at this time due to lack of funding and personnel. Other prevention measures are being implemented, such as resting pastures infested with noxious weeds, and requiring riders to rotate cattle through pastures through weed free travel routes when possible.
Grazing 5. Close pastures to livestock grazing when the pastures are infested to the degree that livestock grazing will continue to either exacerbate the condition on site or contribute to weed seed spread. Designate those pastures as unsuitable range until weed infestations are controlled.
Project design elements include closing pastures or portions thereof to livestock grazing until infestations are controlled.

Goal 3. Maintain healthy, desirable vegetation that is resistant to weed establishment.
*Grazing 6. Through the allotment management plan or annual operating instructions, manage the timing, intensity (utilization), duration, and frequency of livestock activities associated with harvest of forage and browse resources to maintain the vigor of desirable plant species and retain live plant cover and litte*r.
Project is designed to meet this goal.

Grazing 7. Manage livestock grazing on restoration areas to ensure that vegetation is well established. This may involve exclusion for a period of time consistent with site objectives and conditions. Consider practices to minimize wildlife grazing on the areas if needed.
Project design element includes resting from livestock after vegetation treatments.

Goal 4. Minimize disturbed ground conditions favorable for weed establishment in the management of livestock grazing.
Grazing 8. Include weed prevention practices that reduce ground disturbance in allotment management plans and annual operating instructions. Consider for example: changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.
Allotments are managed to standards for effective ground cover as prescribed in the Grassland Plan and the Programmatic Biological Assessment for 2003-2006.
Grazing 9. Inspect known areas of concentrated livestock use for weed invasion. Inventory and manage new infestations.
Noxious weed inventory (off roads) was completed for this project, and is ongoing.

Goal 5. Improve effectiveness of weed prevention practices through awareness programs and education. Promote weed awareness and prevention efforts among range permittees.
Grazing 10. Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with permittees' livestock management practices.
The District noxious weed coordinator facilitates the annual operating plan meetings with permittees whose allotments have concentrated weed infestations.
Grazing 11. To aid in their participation in allotment weed control programs, encourage permittees to become certified pesticide use applicators.
Noxious weed control using herbicides is accomplished through an agreement between the Crooked River National Grassland and the Jefferson County Weed Control Office. The rationale is using a single, professional applicator to maintain continuity of program and facilitate reporting of herbicide use.

Watershed Management

Goal 1. Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.
Watershed 1. Inspect and document for early detection of noxious weed establishment and spread in riparian areas and wetlands. Eradicate new infestations before they become established.
Project design includes no specific treatment for riparian and wetlands, but design elements include pre-treatment inventory and assessment.
Watershed 2. Address noxious weed risks in watershed restoration projects and water quality management plans.
A noxious weed risk assessment for this project has been completed.

Appendix J Biological Evaluation For Sensitive Fish, Wildlife And Plant Species And Biological Assessment For Listed Species

Biological Evaluation For Sensitive Fish, Wildlife And Plant Species And Biological Assessment For Listed Species - Summary Of Effects

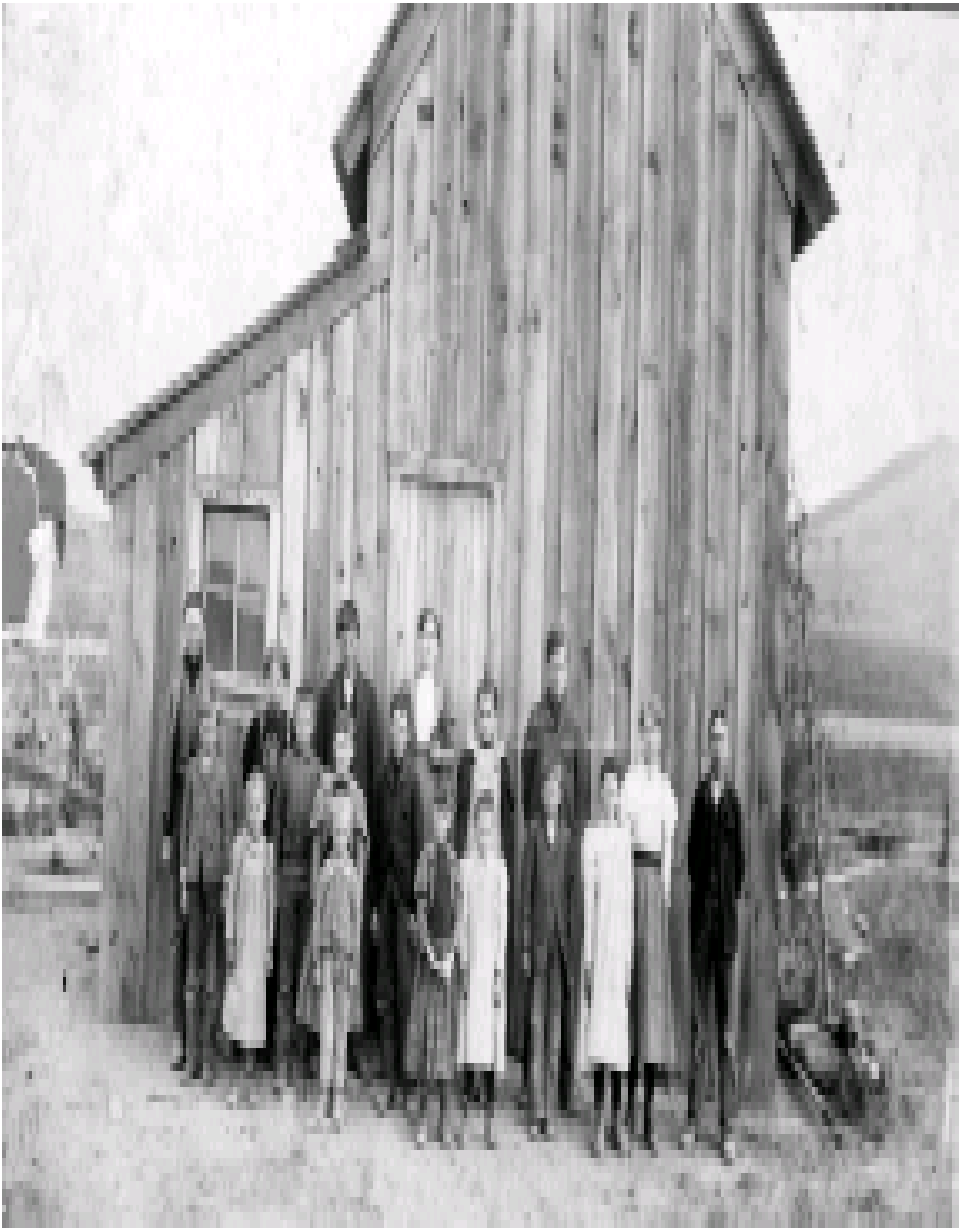
Species	Listing	Alt A	ALT B	ALT C	ALT D
Redband trout	Sensitive	MIIH	NI	MIIH	MIIH
Bull trout	Threatened	NLAA	NLAA	NLAA	NLAA
Mid-Columbia River steelhead trout	Threatened	NE	NE	NE	NE
Malheur mottled sculpin	Sensitive	NI	NI	NI	NI
Mid-Columbia River spring chinook salmon EFH	Sensitive	NLA	NI	NLA	NLA
Mid-Columbia River spring chinook salmon	Sensitive	NI	NI	NI	NI
Westslope cutthroat trout	Sensitive	NI	NI	NI	NI
Columbia spotted frog	Sensitive	MIIH	NI	MIIH	MIIH
Northern bald eagle	Threatened	NLAA	NLAA	NLAA	NLAA
Canada lynx	Threatened	NE	NE	NE	NE
Peregrine falcon	Sensitive	NI	NI	NI	NI
Tri-colored blackbird	Sensitive	NI	NI	NI	NI
Bufflehead	Sensitive	NI	NI	NI	NI
Upland sandpiper	Sensitive	NI	NI	NI	NI
Pygmy rabbit	Sensitive	NI	NI	MIIH	MIIH
Gray Flycatcher	Sensitive	NI	NI	MIIH	MIIH
California wolverine	Sensitive	NI	NI	NI	NI
Greater sage grouse	Sensitive	NI	NI	NI	NI
Achnatherum hendersonii	Sensitive	NI	MIIH	MIIH	MIIH
Achnatherum wallowaensis	Sensitive	NI	MIIH	MIIH	MIIH
Artemesia ludoviciana ssp. *estesii*	Sensitive	NI	MIIH	MIIH	MIIH
Astragalus diaphanus var. *diurnus*	Sensitive	NI	NI	NI	NI
Astragalus peckii	Sensitive	NI	MIIH	MIIH	MIIH
Astragalus tegetarioides	Sensitive	NI	NI	NI	NI
Botrychium ascendens	Sensitive	NI	NI	NI	NI
Botrychium crenulatum	Sensitive	NI	NI	NI	NI
Botrychium minganense	Sensitive	NI	NI	NI	NI
Botrychium montanum	Sensitive	NI	NI	NI	NI
Botrychium paradoxum	Sensitive	NI	NI	NI	NI
Botrychium pinnatum	Sensitive	NI	NI	NI	NI
Calochortus longebarbatus var. *longebarbatus*	Sensitive	NI	NI	NI	NI
Calochortus longebarbatus var. *peckii*	Sensitive	NI	NI	NI	NI
Camissonia pygmaea	Sensitive	NI	MIIH	MIIH	MIIH
Carex backii	Sensitive	NI	NI	NI	NI
Carex hystericina	Sensitive	NI	MIIH	MIIH	MIIH
Carex interior	Sensitive	NI	NI	NI	NI
Carex stenophylla (C. eleocharis)	Sensitive	NI	NI	NI	NI
Cypripedium parviflorum	Sensitive	NI	NI	NI	NI
Lomatium ochocense	Sensitive	NI	NI	NI	NI
Mimulus evanescens	Sensitive	NI	MIIH	MIIH	MIIH
Penstemon peckii	Sensitive	NI	MIIH	MIIH	MIIH
Rorippa columbiae	Sensitive	NI	MIIH	MIIH	MIIH
Thelypodium eucosmum	Sensitive	NI	NI	NI	NI
Thelypodium howellii	Sensitive	NI	MIIH	MIIH	MIIH

Determination for Federally Listed Species:
NE no effect
LAA may effect - likely to adversely affect
NLAA may effect - not likely to adversely affect
BE beneficial effect

Determination for Sensitive Species:
NI no impact
MIIH may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species
WIFV* will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species
BI beneficial impact

**** Trigger for a Significant Action as defined in NEPA***

<u>Appendix K</u> Riparian Management Objectives



Riparian Management Objectives

PACFISH is a management strategy for anadromous fish-producing watersheds on federal lands in eastern Oregon. There are no threatened or endangered anadromous fish species within the project area. However, fish passage for anadromous fish is expected over the Pelton and Round Butte Dam Complex within the next 5 to 10 years. As a result, both INFISH and PACFISH requirements are addressed in this document.

(RMOs) Common to Aquatic Resources - (INFISH 1995 and PACFISH 1995)

Inland Native Fish Strategy (INFISH 1995) Environmental Assessment and the Environmental Assessment for Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH 1994) were to provide direction to protect habitat and populations of resident native fish and anadromous fish. The goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. Since the quality of water and fish habitat in aquatic systems is inseparably related to the integrity of upland and riparian areas within the watersheds, the strategy identifies several goals for watershed, riparian, and stream channel conditions. These goals are to maintain or restore:

- water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
- stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
- instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges;
- natural timing and variability of the water table elevation in meadows and wetlands;
- diversity and productivity of native and desired non-native plant communities in riparian zones;
- riparian vegetation, to:
    - provide an amount of distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
    - provide adequate summer and winter thermal regulation within the riparian and aquatic zones; and
    - help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed
- riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region; and
- habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

INFISH 1995

Grazing Management

GM-1 Modify grazing practices (e.g., accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing, etc.) that retard or prevent attainment of Riparian Management Objectives or are likely to adversely affect inland native fish. Suspend grazing if adjusting practices is not effective in meeting Riparian Management Objectives.

GM-2 Locate new livestock handling and/or management facilities outside of Riparian Habitat Conservation Areas. For existing livestock handling facilities inside the Riparian Habitat Conservation Areas, assure that facilities do not prevent attainment of Riparian Management Objectives. Relocate or close facilities where these objectives cannot be met.

GM-3 Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and times that would not retard or prevent attainment of Riparian Management Objectives or adversely affect inland native fish.

PACFISH 1995

GM-1 Adjust grazing practices (e.g. length of grazing season, stocking levels, timing of grazing, etc.) to eliminate impacts that are inconsistent with attainment of Riparian Management Objectives. If adjusting practices is not effective, eliminate grazing.

GM-2 Locate new livestock handling and/or management factilities outside Riparian Habitat Conservation Areas. For existing livestock handling facilities inside of Riparian Habitat conservation Areas, assure that Riparian Management Objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities.

GM-3 Limit livestock trailing, bedding, watering, salting, loading, and other handling efforts to those areas and time that will assure Riparian Management Objectives are met.

INFISH 1995

Fire/Fuels Management

FM-1 Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management actions could perpetuate or be damaging to long-term ecosystem function for inland native fish.

FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

FM-5 Immediately establish an emergency team to develop a rehabilitation treatment plan to attain Riparian Management Objectives and avoid adverse effects on inland native fish whenever Riparian Habitat conservation Areas are significantly damaged by a wildfire or a prescribed fire burning out of prescription.

PACFISH 1995

FM-1 Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of Riparian Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management actions could perpetuate or be damaging to long-term ecosystem function.

FM-4 Design prescribed burn projects and prescriptions to contribute to the attainment of the Riparian Management Objectives.

FM-5 Immediately establish an emergency team to develop a rehabilitation treatment plan to attain Riparian Management Objectives and avoid adverse effects on inland native fish whenever Riparian Habitat conservation Areas are significantly damaged by a wildfire or a prescribed fire burning out of prescription.

Tables 1 and 2 display riparian management objectives (RMO) for perennial streams within the Grassland (INFISH, 1995; PACFISH 1994).

Table A-1 Interim Riparian Management. (INFISH 1995)

Habitat Feature	Interim Objectives
Pool Frequency (all systems)	Varies by channel width (see Table A-2)
Water Temperature	No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7- day period) Maximum water temperature below 64 F.
Large Woody Debris (forested areas)	> 20 pieces per mile; Greater than 12 inches diameter; Greater than 35 foot length
Bank Stability	> 80 percent of stream banks would be stable
Lower Bank Angle	>75 percent of banks with <90 degree angle (i.e. undercut)
Width/Depth Ratio (all systems)	<10, mean wetted width divided by mean depth

Table A-2. Interim objectives for pool frequency. (INFISH 9115)

Average Wetted Width (ft)	10	20	25	50	75	100	125	150	200
Average Number Pools/Mile	96	56	47	26	23	18	14	12	9

Table B-1 Interim Riparian Management. (PACFISH 1995)

Habitat Feature	Interim Objectives
Pool Frequency (all systems)	Varies by channel width (see Table A-2)
Water Temperature (all systems)	Compliance with state water quality standards, or maximum <68 degrees F
Large Woody Debris (forested areas)	East of Cascade Crest in Oregon, Washington, Idaho. > 20 pieces per mile; >12 inches diameter; > 35 foot length
Bank Stability (non-forested systems)	> 80 percent stable
Lower Bank Angle (non-forested systems)	>75 percent of banks with <90 degree angle (i.e. undercut)
Width/Depth Ratio (all systems)	<10, mean wetted width divided by mean depth

Appendix L Fisheries LRMP Management Indicator Species (MIS) (LRMP Page 4-119) & Threatened, Sensitive, And Endangered Species (LRMP Page 4-119 And 120) Aquatic Species Associated With Springs and Bogs - Standards and Guidelines and Wildlife Habitat Specialists List

Fisheries LRMP Management Indicator Species (MIS) (LRMP Page 4-119) & Threatened, Sensitive, And Endangered Species (LRMP Page 4-119 And 120)

Aquatic Species Associated With Springs and Bogs Standards and Guidelines

Wildlife Habitat Specialists List

LRMP Management Indicator Species (MIS) (LRMP Page 4-119)

The Forest Plan identified MIS to help determine the effects of management activities on fish and their habitat.

- Rainbow trout was selected as an indicator of riparian and aquatic habitat.
- Rainbow trout are no longer stocked by ODFW in streams on the Grassland. Rainbow trout habitat requirements are similar to redband trout and would be found in the same stream systems if stocking still occurred. Effects to rainbow trout habitat would be the same as the effects described for redband trout habitat in the section on threatened, endangered, and sensitive species.
- Provide habitat by managing as required in the riparian management area prescription.

Threatened, Sensitive, And Endangered Species (LRMP Page 4-119 And 120)

- Cooperate with state and federal fish agencies in developing recovery plans for threatened or endangered aquatic species. Recovery plans take precedence over other management direction.
- Consult with the U.S. Fish and Wildlife Service when conflicts between project activities and habitat needs cannot be resolved, or when uncertainty exists.
- Maintain inventories of essential or critical aquatic habitats including their location and distribution.
- Maintain contacts with Federal, State, and other agencies, groups, and individuals concerned with the management of threatened, endangered, and sensitive plant and animal species. Consult with the Oregon Department of Fish and Wildlife, Oregon Natural Heritage Data Base and U.S. Fish and Wildlife Service for technical assistance in developing species management guides and in determining viable population levels.
- Perform a field reconnaissance when suitable habitats or reported locations are suspected to occur in the area of influence of the project, to more precisely verify the presence, abundance, and distribution of the sensitive species. If the search is conducted during a season of the year when positive identification is probable, and no listed species are found, document this fact and no further investigations will be needed.
- Spell out identified safeguards in the environmental analysis and project plan; project personnel will be fully responsible for being aware of and implementing these safeguards. Supervisors of the activity must assure that actions which jeopardize the listed species do not occur.
- Defer actions which may affect habitat for Federally listed endangered or threatened species, if they can not be avoided, until a formal consultation with the endangered species branch of the Fish and Wildlife Service is completed to determine a course of action.

Species Associated with Springs and Bogs (LRMP page 4-123)

- Identify and evaluate seeps, springs, bogs, other small (less than 10 acres) wet areas, and any other unique habitat on a project level basis, while providing appropriate protection.

Wildlife Habitat Specialists List

Habitat Specialists for the CRNG
American Goldfinch
Bald Eagle
Belding's Ground Squirrel
Bighorn Sheep
Black-throated Sparrow
Brewer's Sparrow
Brown Creeper
Burrowing Owl
California Quail
Northern Flicker
Ferruginous Hawk
Flammulated Owl
Golden Eagle

Gray Flycatcher
Gray Squirrel
Horned Lark
Lark Sparrow
Lazuli Bunting
Least Chipmunk
Lewis' Woodpecker
Loggerhead Shrike
Mountain Quail
Mule Deer
Northern Flicker
Northern Goshawk
Pileated Woodpecker
Pine Grosbeak
Prairie Falcon

Pygmy Nuthatch
Pygmy Rabbit
Rocky Mountain Elk
Sage Grouse
Sage Sparrow
Sage Thrasher
Sharp-tailed Grouse
Western Big-eared Bat
Western Screech Owl
White-headed Woodpecker
Pronghorn

<u>Appendix M</u> Aquatic Data/Information Available By Watershed

Aquatic Data/Information Available By Watershed

Willow Creek Watershed

Data Available

No formal field surveys have been conducted on intermittent and ephemeral channels within these allotments to assess geomorphic condition. This is noted as an opportunity and data need within the Crooked River Grassland Watershed Assessment (2002). Sources of information used for this analysis include:

- 1 meter digital imagery,
- 1:15,840 aerial photo interpretation, existing GIS coverage's within Ochoco National Forest GIS database
- Physical and biological surveys conducted by the Oregon Department of Fish and Wildlife.
- Willow Creek Watershed Assessment (2000).

Methods and Procedures

High-resolution digital imagery and aerial photos are used to identify presence or absence of riparian vegetation or bodies of water within the allotment. Riparian habitat conservation areas are delineated on existing GIS coverages available on the Grassland.

The physical and biological survey conducted in 1979 assessed Willow Creek in quarter mile segments on about 46 miles of stream. Physical channel condition was recorded as well as the results of electrofishing surveys where water was present. The survey also provided hand drawn maps of each quarter mile stream segment.

Previous Analysis of Area

The Crooked River National Grassland Watershed Analysis was completed in 2003.

Whychus Watershed

Data Available

- Continuous stream temperature monitoring 1995 to 2002
- Snorkel and electrofishing surveys
- Redd counts
- Level II stream surveys
- 1 meter black and white digital imagery
- 1:15,840 aerial photos
- GIS coverages delineating buffers for class I-IV RHCAs

Methods and procedures

- Stream temperature data were collected by electronic probes measuring data at 1-1.5 hour intervals throughout the summer. Data is available for years 1995 to 2002 (according to DEQ protocol for 2001-2003).
- Snorkel surveys, electrofishing surveys, and physical stream surveys were obtained using Forest Service Region 6 protocols for Level II stream surveys.
- Redd counts were obtained by field surveys using visual observation of potential redd sites. These sites are generally located at pool tail outs (i.e., downstream end of the pool).
- Stream classification (perennial flow with spawning habitat, perennial flow and intermittent flow), is based on presence of riparian shrub vegetation and other indicators of perennial flow. District biologists and hydrologists delineated riparian habitat conservation areas (RHCA) from 1:24,000 USGS, field surveys, and aerial photo interpretation.

Previous Analysis of the Area

Squaw Creek has been surveyed as described previously. No riparian surveys have been conducted on intermittent streams within the Whychus Watershed. The Crooked River National Grassland Watershed Analysis was completed in 2003.

Mud Springs Creek Watershed

Data Available

- 1 meter black and white digital imagery
- 1:15,840 aerial photos
- GIS coverage's delineating buffers for Class I-IV RHCA's

Methods and Procedures

- Information on redband trout presence is limited to sightings with no verification by electro-fishing or other sampling methods. Genetic analyses have not been performed to determine whether these are planted or wild strains of rainbow trout.
- Information relating to the existing condition of the stream channel at Mud Springs Creek was obtained by limited site visits. No formal stream surveys have been completed for Mud Springs Creek.
- Channel patterns, and riparian vegetative condition are interpreted from black and white digital imagery and aerial photo interpretation.

Previous Analysis of Area

No formal habitat or population surveys have been conducted in the North or Fox allotment. Except for Mud Springs Creek, neither allotment contains perennial streams supporting aquatic resources.
The Crooked River National Grassland Watershed Analysis was completed in 2003.

Deschutes South Watershed

Data Available

- 1-meter digital imagery
- Ochoco National Forest GIS coverage's
- 2003 field reconnaissance for spotted frogs

Methods and procedures

- High resolution digital imagery and aerial photos were used to identify presence or absence of riparian vegetation or bodies of water within the allotment.
- Riparian habitat conservation areas were delineated on existing GIS coverage available on the Crooked River National Grassland.

Previous Analysis of Area

No previous analysis of aquatic resources is available for this watershed. The Crooked River National Grassland Watershed Analysis was completed in 2003.

Steelhead Watershed, Lake Billy Chinook Deschutes Watershed, Crooked River Grassland Watershed, Lower Crooked River Valley

Data Available

- 1 meter black and white digital imagery
- 1:15,840 aerial photos
- Ochoco National Forest GIS coverage's delineating buffers for Class I-IV RHCA's
- PGE technical studies of the Deschutes River Basin Related to Relicensing of the Pelton Round Butte Dam Complex.

Methods and Procedures

- Information on redband trout, steelhead, and salmon populations was obtained from references relating to the Pelton Round Butte Dam Complex Relicensing Project.
- Information relating to the existing condition of the Deschutes River channel was obtained by site visits, Stream surveys completed by the Oregon Department of Fish and Wildlife, and surveys completed under contract for Portland General Electric relating to the Pelton-Round Butte Dam Complex relicensing project.
- Channel patterns, and riparian vegetative condition are interpreted from black and white digital imagery and aerial photo interpretation.

Previous Analysis

No previous analysis of aquatic resources is available for this allotment. The Crooked River National Grassland Watershed Analysis was completed in 2002.

Lower Lake Billy Chinook Metolius Watershed

Data Available

- 1 meter black and white digital imagery
- 1:15,840 aerial photos
- Ochoco National Forest GIS coverage's delineating buffers for Class I-IV RHCA's
- PGE technical studies of the Deschutes River Basin Related to Relicensing of the Pelton Round-Butte Dam Complex.

Methods and Procedures

- Information on redband trout, steelhead, and salmon populations was obtained from references relating to the Pelton Round Butte Dam Complex Relicensing Project, stream surveys completed by the Oregon Department of Fish and Wildlife, and surveys completed under contract for Portland General Electric relating to the Pelton Round Butte Dam Complex relicensing project.
- Channel patterns, and riparian vegetative condition are interpreted from black and white digital imagery and aerial photo interpretation.

Previous Analysis

The Lower Lake Billy Chinook Metolius Watershed is part of Lake Billy Chinook. Previous analyses have been conducted in the lower Metolius River and found that the only spawning activity of redband in the lower mainstem of the Metolius River was observed in late July (Riehle and Houslet 1999 as cited in the Fisheries Report page 26). This work was conducted as a component of relicensing for the Pelton Round-Butte Dam Complex and can be obtained from Portland General Electric (Groves et al. 1999)

Hay Creek Watershed

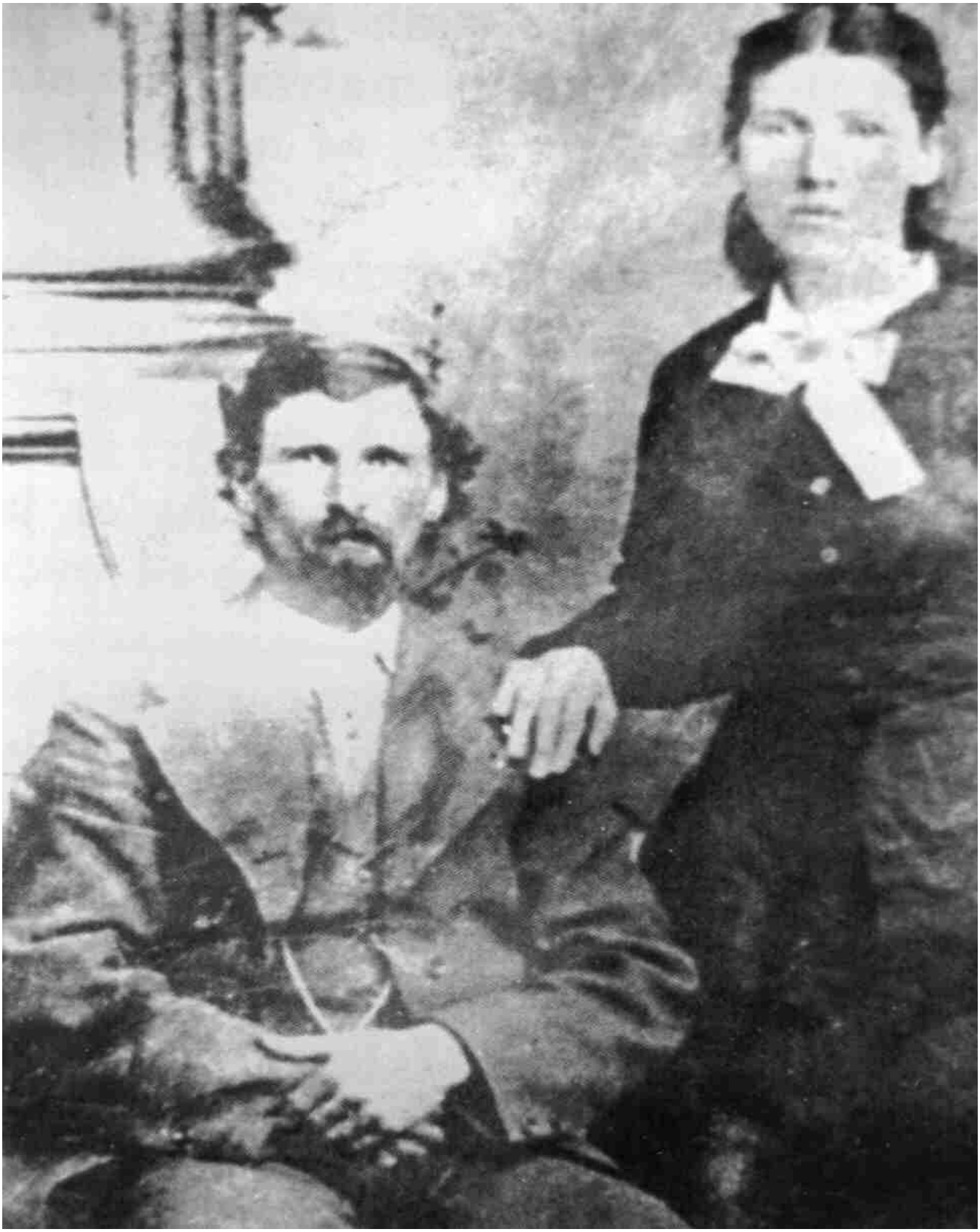
Data Available

- 1 meter black and white digital imagery
- 1:15,840 aerial photos
- Ochoco National Forest GIS coverage's delineating buffers for class I-IV RHCAs

Methods and Procedures

- Channel patterns, and riparian vegetative condition are interpreted from black and white digital imagery and aerial photo interpretation.

<u>Appendix N</u> Joint Aquatic And Terrestrial Programmatic Biological Assessment For Lands Within The Deschutes Basin Administered By The Bureau Of Land Management Prineville Office And The Deschutes And Ochoco National Forests



Joint Aquatic And Terrestrial Programmatic Biological Assessment For Lands Within The Deschutes Basin Administered By The Bureau Of Land Management Prineville Office And The Deschutes And Ochoco National Forests

Crooked River National Grassland
Rangeland EIS 2003

Project Design Criteria For Bull Trout, Steelhead Trout And Chinook Salmon Efh:

The following is an itemized list of PDCs from the Joint Aquatic and Terrestrial Programmatic BIOLOGICAL ASSESSMENT 2003-2005. The third column is a determination if the proposed project meets the design criteria.

If the project does not meet pdc's, for listed species consultation may be needed. For all species, mitigation may be required.

	Project Design Criteria	**Yes, No, or NA**
Large wood	1. Do not remove standing/down wood from Riparian Reserves or RHCAs unless health and safety and/or forest health issues require treatment to meet Aquatic Conservation Strategy or Riparian Management Objectives.	
	(a) Project must not retard attainment of coarse down woody debris objectives within Riparian Reserves or RHCAs as determined by vegetation type within the immediate project site.	Yes
	(b) Project must not retard attainment of in-stream wood objectives established in watershed analysis. If a watershed analysis is not completed, the project will not retard attainment of a minimum of 20 pieces of large wood per mile that are at least 12 inches in diameter and 35 feet in length.	Yes
	2. Allow hazard trees that can reasonably fall into the water body to be placed in the water body to maintain fish habitat and hydrologic function.	
	(a) Hazard tree felling or placement in streams will not disturb listed fish or spawning areas. Site will be surveyed within 7 days prior to the implementation of the project by a qualified fish biologist to ensure no listed fish are present.	Yes
	(b) A habitat assessment is required to maintain bull trout and chinook habitat when logs are moved for boating safety where allowed under the Metolius Wild and Scenic River Plan. The habitat assessment form will be attached to the BE (see Appendix E).	NA
	(c) Hazard trees within the Riparian Reserves or RHCAs that represent an opportunity for topping for wildlife needs may be retained as snags.	
	(d) Hazard trees may be removed from Riparian Reserves or RHCAs if needed to allow for the normal operation of the recreation/special use site, or if a liability issue arises. Whenever possible leave large woody debris on site.	NA NA
Water Temperature	1. Do not allow land management activities that lead to measurable increases in stream temperature due to the loss of shade.	Yes
	2. Do not allow land management activities that alter flow regimes that lead to a measurable increase in stream temperature.	Yes
Sediment and Substrate	1. Do not allow ground-based machinery use within Riparian Reserves, RHCAs, or within a water body that increases soil compaction or removes vegetation that exposes soil to erosion processes. Within designated campgrounds (within Riparian Reserves or RHCAs), machinery will not leave designated roads or parking areas.	Yes
	2. Do not locate landings within Riparian Reserves or RHCAs.	
	3. Do not construct firelines within Riparian Reserves or RHCAs.	NA
	4. Ignite controlled burns outside of Riparian Reserves or RHCAs (except for hand pile burning). Fires that back into Riparian Reserves or RHCAs will be coordinated with a fish biologist. Prescribed fire will not reduce ground cover	Yes Yes

	Project Design Criteria	Yes, No, or NA
	that will expose soil to erosion within Riparian Reserves or RHCAs. 5. All hand piling and pile burning of slash in Riparian Reserves and RHCAs will occur a minimum of 50 feet from the outer edge of riparian vegetation, but the actual distance may be greater depending on surrounding slope, existing ground cover, and soil type. Placement of hand piles will focus on upslope areas outside of "washes" or depressions that may facilitate concentrations of upslope water run off (e.g., caused by heavy rain events) and hence, sediment transport to the stream. Ochoco NF will ensure that sediment will not be delivered to the stream channel as a result of hand piling/burning activities. Piles would not cover more than 5% of the RHCA within the project area. Burning would occur in conditions that would not allow for creeping greater than 10 feet from the pile. 6. New temporary roads will be located outside of sediment delivery zones (as determined by soil type, ground vegetation, and slope), will meet BMPs for relief drainage, and will be hydrologically closed. 7. Commercial road use, including hauling/blading, will not contribute to siltation off the road. 8. Snow plowing will allow water/runoff to drain off road with filtration (vegetation buffer) before reaching creeks. 9. Culvert replacements on Class III and IV streams (i.e. non-fish bearing streams) will meet BMPs in order to decrease sediment input both during and after construction activities (e.g., adequate road ditch relief, cross drains, wing wall rip-rapping). 10. Do not allow in-channel, in lake, or shoreline digging where removal of substrate occurs or significant disruption to potential spawning or rearing habitat occurs (e.g., in-stream gravel mining or dredging). Control road traffic during wet periods to prevent damage to Riparian Reserves and RHCAs.	Yes NA NA NA NA NA NA
Bank Stability	1. Do not allow permitted activities to artificially raise or lower natural water levels for the system. 2. Activities will not reduce the amount of vegetative cover to the point of creating streambank instability. The minimum threshold is 90% stable streambanks.	NA Yes
Cumulative Effects to Watershed Condition (use for either 5th or 6th field watersheds)	Do not increase Cumulative Harvest Area (CHA) or Equivalent Harvest Area (EHA) in any watershed that already exceeds 25% with these indices. If the project moves the watershed between 15% and 25%, then must provide a rationale to the Level I Team for their approval prior to implementation explaining why this project will not affect the hydrologic condition. 2. If the open road density within a watershed exceeds 2.5 miles per square mile on the Deschutes NF or 3.0 miles per square mile on the Ochoco NF, do not allow project activities to increase open road densities. Project activities will move toward reducing road densities (i.e. hydrologically close roads) where possible, particularly in Riparian Reserves or RHCAs.	Yes NA
Timing of work	1. Eliminate impacts to spawning, incubating, rearing, and migrating fish by observing seasonal operating restrictions when implementing stream channel or road maintenance work within Riparian Reserves or RHCAs. 2. Within Riparian Reserves or RHCAs, do not allow near stream or instream work that exposes soil to erosional processes from August 15 to May 15 for bull trout and from February 15 to July 15 in steelhead waters. On BLM lands on the Lower Deschutes River the timing restriction is February 15 to March 15. 3. Exceptions to the seasonal operating restrictions for hazard tree placements will require verbal agreement from ODFW, NOAA Fisheries, and/or FWS.	Yes Yes Yes

	Project Design Criteria	Yes, No, or NA
	Inspection of the stream channel for redds or adult fish will be made prior to work (see A.2.a). Falling of trees onto redds will not occur. A fish biologist from ODFW, FS, or BLM will be required on site prior to work being accomplished.	
Livestock Grazing	1. Livestock will be excluded from streams with bull trout spawning habitat from August 15 to December 31 and from January 1 to May 15 of each year to protect bull trout. The Forest Service will monitor pasture entry and exit dates during the grazing season. Exclude livestock from bull trout streams during the shaded time periods:	Yes
	Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec	Yes
	2. Livestock will be excluded from streams with steelhead spawning habitat from February 15 to July 15. The Forest Service will monitor pasture entry and exit dates during the grazing season. Exclude livestock from steelhead trout streams during the shaded time periods:	Yes
	Jan Feb Mar Apr May June July Aug Sep Oct Nov Dec	Yes
	3. Livestock utilization will be measured on the most palatable species within the Designated Monitoring Area (DMA).	
	4. The Ochoco and Deschutes NFs will utilize the Final Range Resource Implementation Monitoring Module (July 2002) with the following additions: Monitor 100% of Category 1 pastures, and a minimum of 35% of Category 2 or other high priority active pastures.	Yes
	Monitoring will be done at least twice to gather information on livestock use and effects. The first monitoring will occur on selected pastures while the livestock are in the pasture. The second monitoring will occur at the end of the growing season.	
	5. Forest Service pasture moves will occur before the alteration condition threshold (trigger) is reached or before the Forage Stubble Height threshold is reached. This means that the stubble height should be 2, 3, or 4 inches (see below) when all cattle have been removed. However, the designated monitoring area is just one location, therefore moves can be initiated based on other areas of concerns within a pasture. These thresholds are:	
	(a) Terraces/Dry Meadows (species other than Kentucky bluegrass [*Poa pratensis*]): The maximum stubble height standard on these sites is: 3-inch stubble height for pasture when livestock are moved by June 30, 4-inch stubble height for pastures with schedules allowing grazing after July 1. Move dates will be earlier on the CRNG because of earlier moisture regimes: 3-inch stubble height if grazed prior to May 31, and 4-inch stubble height if grazed after June 1. In all cases where a stream is not in satisfactory condition, a stubble height standard will be developed based on site conditions and improvement objectives. This standard will be 4 inches or greater for pastures in an unsatisfactory condition or for allotments that did not meet the above criteria the previous year.	
	(b) Kentucky bluegrass-dominated terraces and dry meadows: The maximum stubble height standard is 2-inch stubble height. If the DMA is located on a Kentucky bluegrass terrace, monitoring of the greenline and streambank trampling will also occur to ensure the conditions needed to maintain streams and aquatic habitats are met. There may be cases where streambank trampling and greenline utilization may trigger a move before the 2-inch stubble height criteria on Kentucky bluegrass is met. Whichever threshold (trigger) is reached first will indicate that livestock should be moved. Overall condition at the end of the season will be to maintain the minimums of (c), (d), and (e) as stated below.	Yes
	(c) Pasture moves will be triggered if streambank alteration by livestock is approaching 10% within the DMA. If this condition occurs then bank trampling	

	Project Design Criteria	Yes, No, or NA
	will be measured, documented, and livestock will be moved from the pasture. (d) Changes in preference from herbaceous to woody vegetation is a trigger to move livestock. (e) Greenline vegetation: The maximum stubble height standard for greenline vegetation is 4-inch stubble height on grasses (where grasses will be used as measured triggers), as long as the stream exhibits desired conditions. If the stream does not exhibit desired conditions, the stubble height standard for grasses should be adjusted to 5 or 6-inch (or more) residual stubble height, depending on site conditions. If the chosen DMA has a greenline, then that would be the preferred threshold or trigger to be used. For sites that have rushes and sedges, maximum utilization is 6-inch stubble height. (If cows start showing preference for sedges, this will trigger a move from the pasture). (f) Wet and Moist Meadows: Conduct stubble height monitoring of wet and moist meadow herbaceous vegetation (sedges and rushes) to ensure retention of a minimum of 6-inch residual herbaceous vegetation stubble heights. 6. In all cases where the above standards have not been met (where these unsatisfactory conditions are attributed to livestock), adjustments to the grazing regime (resting pastures, adjusting rotations, increasing stubble height, or creating riparian pastures/exclosures) and/or operational management standards (reduction in numbers, requiring a full time rider, or reduction in duration) will be implemented the following season and be appropriate for achieving these above-stated standards. Separate consultation is required in cases (e.g., specific allotments) where the above standards are not met in two consecutive years.	
Fish Passage and Screens	1. Perform work in dry channels (i.e., diversion ditch) before water is turned on in the spring. 2. All reissued and newly permitted water diversions/withdrawals will have fish screens that meet NOAA Fisheries juvenile fish screen criteria. 3. Provide and maintain fish passage for all life stages at all trail or road crossings of existing and potential fish bearing streams when maintaining or replacing bridges and culverts.	NA NA NA
Water Drafting	The following PDC should be applied to project activities that occur in streams that have listed species and that require short-term water drafting (e.g., minor road maintenance, prescribed burning). It is not intended for use on large wild fires or extensive project activities. Water drafting areas can only occur in streams that are at least 10 cfs. Water drafting in streams less than 10 cfs is outside the scope of this document. Water intakes must meet NOAA Fisheries fish screen criteria. Water drafting applies to short-term water withdrawals, defined as those occurring less than 8 hours/day, not longer than 3 consecutive days, and less than 10% of flow volume removed where the flow volume is measured at the time of the withdrawal. Do not draft out of waters in the current range of steelhead.	Yes
Land Exchange	Land exchanges that include streams and associated habitats for listed species will not be considered under this consultation document.	NA
Herbicides	No herbicide use in bull trout and steelhead-bearing subwatersheds. In subwatersheds without steelhead, there will be no herbicide use in RHCAs.	Na

Appendix O Stream Classification

Stream Classification

Class 1 - Perennial or intermittent flow. High density/number of spawning and/or rearing fish; or if no fish present than provides a potable water source for existing residence on private land or FS facilities.
Class 2 - Perennial or intermittent flow. Moderate density/number or spawning and/or rearing fish; or if no fish present provides high quality water for a Class I stream.
Class 3 - Perennial flow, spring fed stream or has a length greater than 1-1/4 miles. No fish present due to gradient (steep) or physical/biological barriers.
Class 4 - Intermittent flow, defined channel present and less than 1-1/4 miles in length. No fish present or pspring fed sources.
Class 5 - Ephemeral, no defined stream channel. Flow only during spring runoff, during intense storm events.

Standard Widths Defining RHCAs

The four categories of stream or water body and the standard widths for each are:

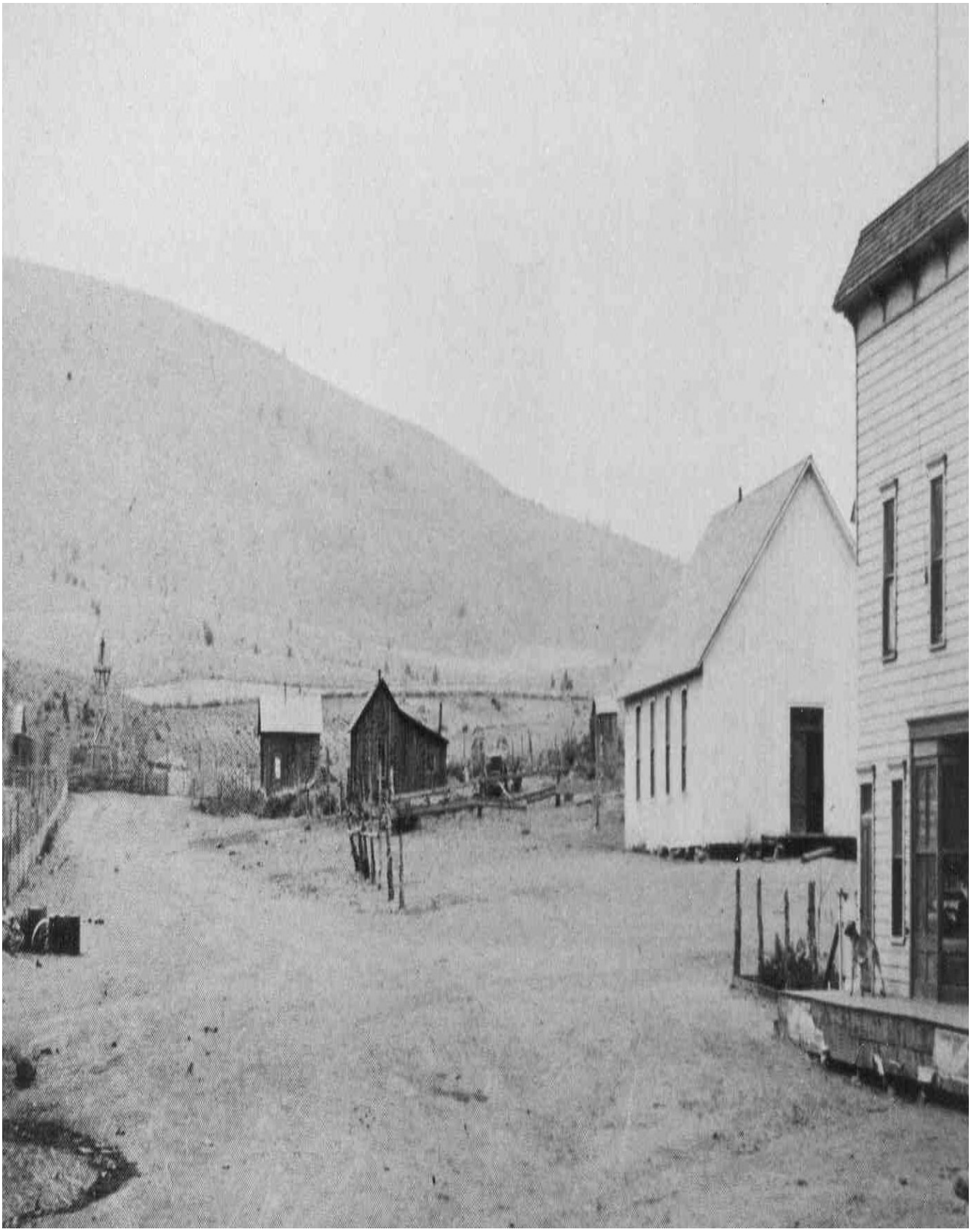
Category 1 – Fish-bearing streams: Interim RHCAs consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

Category 2 – Permanently flowing non-fish-bearing streams: Interim RHCAs consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 00-year flood plain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

Category 3 – Ponds, lakes, reservoirs, and wetlands greater than 1 acre: Interim RHCAs consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstale areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

Category 4 – Seasonally flowing or Intermittent streams, wetlands less than 1 acre, landslides and landslide-prone areas: This category includes features with high variability in size and site-specific characteristics. At a minimum the interim RHCAs must include:
the extent of landlsides and landslide-prone areas
the intermittent stream channel and the area to the top of the inner gorge

Appendix P Alternative C Soils Within Treatment Areas by Watershed



Alternative C-Soils Within Treatment Areas by Watershed

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
Crooked River Grasslands	10	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	152
[redacted]			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	4
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		156
	10 Total			156
	25	rxfire	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	16
		rxfire Total		17
	25 Total			17
	26	rxfire	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	19
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	9
		rxfire Total		28
	26 Total			28
	30	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	11
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	19
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	101
		cs Total		131
	30 Total			131
	31	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	7
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	108
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	53
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		168
	31 Total			168
	32	cs	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	0
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	273
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	13
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	99
		cs Total		385

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]	32 Total			385
	33	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	7
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	125
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	126
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
[redacted]		cs Total		258
	33 Total			258
	35	cs	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	55
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	139
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	55
[redacted]		cs Total		250
	35 Total			250
	36	cs_till_seed_f	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	26
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	3
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	9
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 15 TO 30 PERCENT SOUTH SLOPES	5
			REDMOND-DESCHUTES-STUKEL COMPLEX, 0 TO 15 PERCENT SLOPES	166
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	6
		cs_till_seed_f Total		215
	36 Total			215
	37	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	307
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	26
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	4
		cs Total		337
	37 Total			337
	38	cs_till_seed_f	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	7
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	0
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	3
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	77
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	0

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	75
		cs_till_seed_f Total		162
	38 Total			162
	39	cs_till_seed_f	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	183
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	7
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	346
		cs_till_seed_f Total		536
	39 Total			536
	40	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	36
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	31
		cs Total		68
	40 Total			68
	41	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	32
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	50
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	82
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	2
		cs Total		167
	41 Total			167
	49	rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	17
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	0
		rxfire Total		17
	49 Total			17
	65	cs	ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	16
			ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	205
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	16
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
		cs Total		237
	65 Total			237
	66	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	311
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	32

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	99
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	2
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	10
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	1
		cs Total		455
	66 Total			455
	69	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	169
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	48
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	6
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	5
		cs Total		228
	69 Total			228
	70	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	42
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	33
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	2
		cs Total		77
	70 Total			77
	78	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	30
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	68
		cs Total		98
	78 Total			98
	79	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	10
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	7
		cs Total		17
	79 Total			17
Crooked River Grasslands Total				**4009**
Deschutes South	7	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	144
[redacted]			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	64
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	116
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	105
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	0

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	19
		cs_till_seed_f Total		448
	7 Total			448
	8	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	47
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	139
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	120
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	138
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	148
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	17
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	74
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
		cs_till_seed_f Total		683
	8 Total			683
	10	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	2
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	17
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
		cs Total		19
	10 Total			19
	11	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	5
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	114
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	66
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	262
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	152
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	24
		cs_till_seed_f Total		623
	11 Total			623
	12	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	41
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	89
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	88
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	336
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	53

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	117
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	14
		cs_till_seed_f Total		738
	12 Total			738
	17	mech	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	34
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	41
		mech Total		75
	17 Total			75
	18	mech	AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	27
			TETHEROW-CLOVKAMP COMPLEX, 8 TO 50 PERCENT SLOPES	11
		mech Total		38
	18 Total			38
	19	mech	AGENCY LOAM, 3 TO 8 PERCENT SLOPES	3
		mech Total		3
	19 Total			3
	25	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	0
		rxfire Total		1
	25 Total			1
	26	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	36
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	3
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	3
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	86
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	52
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	149
		rxfire Total		329
	26 Total			329
	33	cs	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	10
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
[redacted]		cs Total		10

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]	33 Total			10
	34	cs	ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	4
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	328
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	57
		cs Total		390
	34 Total			390
	40	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	149
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	203
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	18
		cs Total		371
	40 Total			371
	42	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	38
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	121
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	31
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	4
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	78
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	141
		cs_till_seed_f Total		413
	42 Total			413
	61	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	2
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	0
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	229
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	76
			TETHEROW-CLOVKAMP COMPLEX, 8 TO 50 PERCENT SLOPES	1
		cs Total		308
	61 Total			308
	62	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	159
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	8
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	0

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	0
		cs Total		167
	62 Total			167
	77	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	2
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	48
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	15
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	54
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	200
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	276
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	276
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	5
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	31
		cs Total		907
	77 Total			907
	82	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	73
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	17
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	210
			MADRAS LOAM, 3 TO 8 PERCENT SLOPES	9
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	110
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	1
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	424
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	3
			WATER	21
		cs Total		869
	82 Total			869
	91	cs	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	1
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	19
		cs Total		20
	91 Total			20
	92	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	127

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			DEGNER SOILS, 2 TO 12 PERCENT SLOPES	10
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	27
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	4
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	78
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	127
		cs Total		373
	92 Total			373
	93	cs	ERA SOILS, 8 TO 40 PERCENT SLOPES	75
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	6
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	11
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	4
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	18
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	3
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	97
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	202
		cs Total		416
	93 Total			416
Deschutes South Total				**7201**
Lake Billy Chinook	10	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	4
[redacted]			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		4
	10 Total			4
	19	mech	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	41
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	112
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	7
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	81
		mech Total		241
	19 Total			241
	20	mech	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	4
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	42
		mech Total		46
	20 Total			46

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]	21	mech	AGENCY LOAM, 3 TO 8 PERCENT SLOPES	47
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	30
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	10
		mech Total		87
	21 Total			87
	47	cs_pile_rxfir	HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	956
			LAIDLAW SANDY LOAM, 0 TO 15 PERCENT SLOPES	0
			SEARLES-HOLMZIE COMPLEX, MOIST, 15 TO 30 PERCENT SLOPES	37
			WANOGA-FREMKLE-HENKLE COMPLEX, 0 TO 15 PERCENT SLOPES	3
			WANOGA-FREMKLE-HENKLE COMPLEX, 15 TO 30 PERCENT SLOPES	7
		cs_pile_rxfir Total		1003
	47 Total			1003
	48	cs_pile_rxfir	BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	1136
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	34
		cs_pile_rxfir Total		1170
	48 Total			1170
	49	rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	156
			BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	21
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	0
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	330
		rxfire Total		507
	49 Total			507
	53	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	125
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	1
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	0
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	0
		cs Total		126
	53 Total			126
[redacted]	78	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	161
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	11
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	338
		cs Total		510

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]	78 Total			510
	79	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	284
			BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	247
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	4
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	20
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	4
		cs Total		559
	79 Total			559
	80	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	175
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	189
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	77
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	4
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	10
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	39
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	43
		cs Total		537
	80 Total			537
	81	rxfire	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	213
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	129
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	21
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	0
		rxfire Total		363
	81 Total			363
	84	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	110
			BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	653
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	625
			LAIDLAW SANDY LOAM, 0 TO 15 PERCENT SLOPES	26
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	6
			SEARLES-HOLMZIE COMPLEX, 15 TO 30 PERCENT SLOPES	89
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	91
			WANOGA SANDY LOAM, 30 TO 50 PERCENT SLOPES	15
			WANOGA-FREMKLE-HENKLE COMPLEX, 0 TO 15 PERCENT SLOPES	154

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
		cs Total		1769
	84 Total			1769
Lake Billy Chinook Total				**6922**
Lower Crooked River Valley	22	cs_rxfire	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	4
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	15
			ERA SOILS, 1 TO 8 PERCENT SLOPES	1
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	223
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	9
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	293
			SEARLES VERY STONY LOAM, 35 TO 65 PERCENT SLOPES	1
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	14
		cs_rxfire Total		560
	22 Total			560
	23	cs_rxfire	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	1
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	155
			SEARLES VERY STONY LOAM, 35 TO 65 PERCENT SLOPES	0
		cs_rxfire Total		156
	23 Total			156
	24	cs_till_seed_f	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	188
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	10
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	73
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	0
		cs_till_seed_f Total		271
	24 Total			271
	64	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	8
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	264
		cs Total		272
	64 Total			272
	72	cs	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	1
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	7
			CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	37
			ERA SOILS, 1 TO 8 PERCENT SLOPES	0

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			ERA SOILS, 8 TO 40 PERCENT SLOPES	33
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	112
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	283
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	12
		cs Total		485
	72 Total			485
	73	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	35
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	126
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	39
		cs Total		200
	73 Total			200
	86	cs	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	51
			ERA SOILS, 8 TO 40 PERCENT SLOPES	7
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	2
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	379
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	1
			SEARLES VERY STONY LOAM, 35 TO 65 PERCENT SLOPES	50
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	114
		cs Total		604
	86 Total			604
Lower Crooked River Valley Total				**2548**
Mud Springs Creek	1	rxfire	ERA SOILS, 8 TO 40 PERCENT SLOPES	146
[redacted]			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	117
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	153
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	24
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	329
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	44
		rxfire Total		813
	1 Total			813
	2	rxfire	CURANT AND TUB SILT LOAMS, 8 TO 40 PERCENT SLOPES	0
			ERA SOILS, 1 TO 8 PERCENT SLOPES	52
			ERA SOILS, 8 TO 40 PERCENT SLOPES	48
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	131

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	208
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	4
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	130
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	9
		rxfire Total		583
	2 Total			583
	3	cs_rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	28
			DAY CLAY, 8 TO 40 PERCENT SLOPES	36
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	16
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	34
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	27
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	20
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	132
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	307
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	20
		cs_rxfire Total		621
	3 Total			621
	4	cs_rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	2
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	8
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	7
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	24
		cs_rxfire Total		41
	4 Total			41
	9	rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	22
			ERA SOILS, 8 TO 40 PERCENT SLOPES	62
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	41
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	18
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	35
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	303
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	30
		rxfire Total		511
	9 Total			511

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	Label #	TREATMENT	Soil Type	Total
[redacted]	14	cs_rxfire	SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	0
		cs_rxfire Total		0
	14 Total			0
	44	cs_till_seed_f	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	3
			CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	40
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	156
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	1
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	1
		cs_till_seed_f Total		204
	44 Total			204
	45	cs_till_seed_f	ERA SOILS, 1 TO 8 PERCENT SLOPES	16
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	292
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	17
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	72
		cs_till_seed_f Total		397
	45 Total			397
	46	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	3
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	1
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	30
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	53
		cs_till_seed_f Total		87
	46 Total			87
	55	cs	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	194
			ERA SOILS, 8 TO 40 PERCENT SLOPES	137
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	57
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	261
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	31
		cs Total		680
	55 Total			680
	56	cs	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	36
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	6

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	7
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	22
			ERA SOILS, 1 TO 8 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	48
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	48
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	21
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	29
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	35
		cs Total		252
	56 Total			252
	57	cs	BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	43
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	7
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	13
			ERA SOILS, 8 TO 40 PERCENT SLOPES	79
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	358
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	52
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	35
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	150
		cs Total		740
	57 Total			740
	58	cs	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	3
			ERA SOILS, 1 TO 8 PERCENT SLOPES	16
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	196
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	17
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	125
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	277
		cs Total		634
	58 Total			634
	83	cs	MADRAS LOAM, 1 TO 12 PERCENT SLOPES	15
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	16
		cs Total		31
	83			31

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
	Total			
Mud Springs Creek Total				**5594**
Steelhead	50	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	12
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	3
		cs Total		15
	50 Total			15
	51	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	76
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	12
		cs Total		88
	51 Total			88
	68	rxfire	AGENCY SANDY LOAM, 0 TO 3 PERCENT SLOPES	63
			DESCHUTES SANDY LOAM, 3 TO 8 PERCENT SLOPES	7
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 15 TO 30 PERCENT SOUTH SLOPES	195
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SOUTH SLOPES	4
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	1
			STUKEL SANDY LOAM, 3 TO 8 PERCENT SLOPES	9
			STUKEL-DESCHUTES-ROCK OUTCROP COMPLEX, 0 TO 15 PERCENT SLOPES	358
		rxfire Total		638
	68 Total			638
	76	cs	LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	56
			REDCLIFF-LICKSKILLET COMPLEX, 0 TO 15 PERCENT SLOPES	190
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 15 TO 30 PERCENT SOUTH SLOPES	41
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SOUTH SLOPES	20
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	318
			REDSLIDE-LICKSKILLET COMPLEX, 30 TO 50 PERCENT NORTH SLOPES	33
			STUKEL-DESCHUTES-ROCK OUTCROP COMPLEX, 0 TO 15 PERCENT SLOPES	134
			WATER	9
		cs Total		801
	76 Total			801
Steelhead Total				**1542**
Whychus	50	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	186

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	21
		cs Total		207
	50 Total			207
	51	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	76
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	0
		cs Total		76
	51 Total			76
	52	cs_rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	238
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	0
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	18
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	0
		cs_rxfire Total		256
	52 Total			256
	53	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	168
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	1
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	2
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	46
		cs Total		217
	53 Total			217
	54	cs	HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	156
			LAIDLAW SANDY LOAM, 0 TO 15 PERCENT SLOPES	4
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	46
		cs Total		207
	54 Total			207
	67	rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	467
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	226
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	241
			LAFOLLETTE SANDY LOAM, 0 TO 3 PERCENT SLOPES	34
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	37
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 30 TO 50 PERCENT SOUTH SLOPES	41

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	1
			REDSLIDE-LICKSKILLET COMPLEX, 30 TO 50 PERCENT NORTH SLOPES	13
			SEARLES-HOLMZIE COMPLEX, 15 TO 30 PERCENT SLOPES	16
			SEARLES-HOLMZIE COMPLEX, MOIST, 15 TO 30 PERCENT SLOPES	0
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	5
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	412
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	258
		rxfire Total		1751
	67 Total			1751
[redacted]				**2714**
Willow Creek	4	cs_rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	28
[redacted]			ERA SOILS, 8 TO 40 PERCENT SLOPES	13
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	137
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	18
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	71
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	10
		cs_rxfire Total		277
	4 Total			277
	5	cs_rxfire	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	9
			CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	163
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	33
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	11
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	11
		cs_rxfire Total		228
	5 Total			228
[redacted]	6	cs	CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	24
		cs Total		25
	6 Total			25
[redacted]	7	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	120
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	37

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	6
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	100
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	0
		cs_till_seed_f Total		263
	7 Total			263
	11	cs_till_seed_f	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	3
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	98
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	47
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	78
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	37
		cs_till_seed_f Total		263
	11 Total			263
	13	rxfire	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	0
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	66
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	256
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	140
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	6
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	190
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
		rxfire Total		659
	13 Total			659
	14	cs_rxfire	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	0
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	4
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	6
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	2
			ERA SOILS, 1 TO 8 PERCENT SLOPES	91
			ERA SOILS, 8 TO 40 PERCENT SLOPES	118
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	9
			LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	27
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	305
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	130

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	13
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	49
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	49
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	76
		cs_rxfire Total		879
	14 Total			879
	15	rxfire	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	0
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	35
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	893
		rxfire Total		928
	15 Total			928
	16	cs	MADRAS LOAM, 1 TO 12 PERCENT SLOPES	71
		cs Total		71
	16 Total			71
	25	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	5
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	104
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	9
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	28
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	158
		rxfire Total		304
	25 Total			304
	26	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	5
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	8
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	44
		rxfire Total		57
	26 Total			57
	27	cs_till_seed_f	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	3
			COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	137
			ERA SOILS, 1 TO 8 PERCENT SLOPES	65

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]			ERA SOILS, 8 TO 40 PERCENT SLOPES	37
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	246
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	94
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	138
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	39
		cs_till_seed_f Total		759
	27 Total			759
	28	cs_till_seed_f	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	66
			ERA SOILS, 1 TO 8 PERCENT SLOPES	1
			ERA SOILS, 8 TO 40 PERCENT SLOPES	0
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	791
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	14
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	123
		cs_till_seed_f Total		995
	28 Total			995
	29	cs_till_seed_f	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	17
			COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	7
			ERA SOILS, 1 TO 8 PERCENT SLOPES	51
			ERA SOILS, 8 TO 40 PERCENT SLOPES	16
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	1
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	192
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	177
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	78
		cs_till_seed_f Total		542
	29 Total			542
	42	cs_till_seed_f	BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	11
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	48
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	180
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	229
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	3
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	37
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	90

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]		cs_till_seed_f Total		598
	42 Total			598
	43	cs_till_seed_f	LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	1
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	135
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	11
		cs_till_seed_f Total		147
	43 Total			147
	58	cs	ERA SOILS, 1 TO 8 PERCENT SLOPES	22
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	27
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	1
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	119
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	81
		cs Total		250
	58 Total			250
	59	cs	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	408
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	97
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	151
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	2
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	300
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	4
		cs Total		963
	59 Total			963
	60	cs	GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	615
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	203
		cs Total		818
	60 Total			818
	63	cs	ERA SOILS, 8 TO 40 PERCENT SLOPES	12
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	46
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	529
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	16

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	434
		cs Total		1037
	63 Total			1037
	64	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	166
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	72
		cs Total		238
	64 Total			238
	74	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	6
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	493
		cs Total		499
	74 Total			499
	75	cs	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	62
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	27
			ERA SOILS, 1 TO 8 PERCENT SLOPES	25
			ERA SOILS, 8 TO 40 PERCENT SLOPES	22
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	191
			LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	450
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	39
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	12
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	6
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	42
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	123
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	32
		cs Total		1031
	75 Total			1031
	85	cs	GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	1
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	1138
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	13
		cs Total		1152
	85 Total			1152
	86	cs	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	0

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]		cs Total		0
	86 Total			0
	87	cs	CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	63
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	1
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	74
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	11
			LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	98
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	222
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	100
		cs Total		569
	87 Total			569
	88	cs	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	24
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	219
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	149
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	1
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	172
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	4
		cs Total		571
	88 Total			571
	89	cs	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	14
			CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	0
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	242
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	8
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	6
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	4
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	72
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	275
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	18
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH	8

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]			SLOPES	
		cs Total		647
	89 Total			647
	90	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	0
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	28
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	171
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	36
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	199
			MADRAS LOAM, 3 TO 8 PERCENT SLOPES	25
		cs Total		460
	90 Total			460
	91	cs	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	4
			CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	281
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	283
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	95
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	15
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	14
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	9
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	17
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	4
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	114
			MADRAS LOAM, 3 TO 8 PERCENT SLOPES	72
		cs Total		908
	91 Total			908
	92	cs	LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	2
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	36
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	10
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	652
		cs Total		701
	92 Total			701
	93	cs	ERA SOILS, 8 TO 40 PERCENT SLOPES	20

Alternative C - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*		*Soil Type*	*Total*
[redacted]			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	178
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	16
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	6
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	38
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	214
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	50
		cs Total		525
	93 Total			525
Willow Creek Total				
Grand Total				**47894**

<u>Appendix Q</u> Alternative D - Soils Within Treatment Areas by Watershed

Alternative D - Soils Within Treatment Areas

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
Crooked River Grasslands	10	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	152
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	4
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		156
	10 Total			156
	25	rxfire	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	16
		rxfire Total		17
	25 Total			17
	26	rxfire	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	19
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	9
		rxfire Total		28
	26 Total			28
	30	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	11
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	19
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	101
		cs Total		131
	30 Total			131
	31	cs	ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	7
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	108
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	53
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		168
	31 Total			168
	32	cs	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	0
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	273
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	0

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	***Total***
[redacted]			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	13
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	99
		cs Total		385
	32 Total			385
	33	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	7
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	125
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	126
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		258
	33 Total			258
	35	cs	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	55
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	139
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	55
		cs Total		250
	35 Total			250
	36	cs_till_seed_f	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	26
			MADRAS LOAM, 0 TO 3 PERCENT SLOPES	3
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	9
			REDCLIFF-LICKSKILLET-ROCK OUTCROP COMPLEX, 15 TO 30 PERCENT SOUTH SLOPES	5
			REDMOND-DESCHUTES-STUKEL COMPLEX, 0 TO 15 PERCENT SLOPES	166
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	6
		cs_till_seed_f Total		215
	36 Total			215
	37	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	307
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	26
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	4

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	***Total***
[redacted]		cs Total		337
	37 Total			337
	38	cs_till_seed_f	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	7
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	0
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	3
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	77
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	0
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	75
		cs_till_seed_f Total		162
	38 Total			162
	39	cs_till_seed_f	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	183
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	7
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	346
		cs_till_seed_f Total		536
	39 Total			536
	40	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	36
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	31
		cs Total		68
	40 Total			68
	41	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	32
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	50
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	1
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	82
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	2
		cs Total		167
	41 Total			167
	49	rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	17
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	0

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	***Total***
[redacted]		rxfire Total		17
	49 Total			17
	65	cs	ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	16
			ERA-HAYSTACK COMPLEX, 0 TO 8 PERCENT SLOPES	205
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	16
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
		cs Total		237
	65 Total			237
	66	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	311
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	32
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	99
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	2
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	10
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	1
		cs Total		455
	66 Total			455
Crooked River Grasslands Total				**3587**
Deschutes South	7	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	144
[redacted]			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	64
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	116
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	105
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	19
		cs_till_seed_f Total		448
	7 Total			448
	8	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	47
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	139

Alternative D - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	*Total*
[redacted]			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	120
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	138
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	148
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	17
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	74
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
		cs_till_seed_f Total		683
	8 Total			683
	10	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	2
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	17
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
		cs Total		19
	10 Total			19
	11	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	5
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	114
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	66
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	262
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	152
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	24
		cs_till_seed_f Total		623
	11 Total			623
	12	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	41
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	89
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	88
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	336
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	53
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	117
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	14

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	***Total***
[redacted]		cs_till_seed_f Total		738
	12 Total			738
	17	mech	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	34
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	41
		mech Total		75
	17 Total			75
	18	mech	AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	27
			TETHEROW-CLOVKAMP COMPLEX, 8 TO 50 PERCENT SLOPES	11
		mech Total		38
	18 Total			38
	19	mech	AGENCY LOAM, 3 TO 8 PERCENT SLOPES	3
		mech Total		3
	19 Total			3
	25	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	0
		rxfire Total		1
	25 Total			1
	26	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	36
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	3
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	3
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	86
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	52
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	149
		rxfire Total		329
	26 Total			329
	33	cs	LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	10
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	***Total***
[redacted]		cs Total		10
	33 Total			10
	34	cs	ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	4
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	328
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	57
		cs Total		390
	34 Total			390
	40	cs	CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	149
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	203
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			SCHRIER-TUB COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	18
		cs Total		371
	40 Total			371
	42	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	38
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	121
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	31
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	4
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	78
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	141
		cs_till_seed_f Total		413
	42 Total			413
	61	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	2
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	0
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	229
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	76
			TETHEROW-CLOVKAMP COMPLEX, 8 TO 50 PERCENT SLOPES	1
		cs Total		308

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
	61 Total			308
	62	cs	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	159
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	8
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	0
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	0
		cs Total		167
	62 Total			167
Deschutes South Total				**4616**
Lake Billy Chinook	10	cs	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	4
			SCHRIER-TUB COMPLEX, 30 TO 60 PERCENT NORTH SLOPES	0
		cs Total		4
	10 Total			4
	19	mech	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	41
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	112
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	7
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	81
		mech Total		241
	19 Total			241
	20	mech	AGENCY LOAM, 0 TO 3 PERCENT SLOPES	4
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	42
		mech Total		46
	20 Total			46
	21	mech	AGENCY LOAM, 3 TO 8 PERCENT SLOPES	47
			AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	30
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	10
		mech Total		87
	21 Total			87
	47	cs_pile_rxfir	HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	956

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]			LAIDLAW SANDY LOAM, 0 TO 15 PERCENT SLOPES	0
			SEARLES-HOLMZIE COMPLEX, MOIST, 15 TO 30 PERCENT SLOPES	37
			WANOGA-FREMKLE-HENKLE COMPLEX, 0 TO 15 PERCENT SLOPES	3
			WANOGA-FREMKLE-HENKLE COMPLEX, 15 TO 30 PERCENT SLOPES	7
		cs_pile_rxfir Total		1003
	47 Total			1003
	48	cs_pile_rxfir	BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	1136
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	34
		cs_pile_rxfir Total		1170
	48 Total			1170
	49	rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	156
			BAKEOVEN-AGENCY-MADRAS COMPLEX, 0 TO 3 PERCENT SLOPES	21
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	0
			MADRAS SANDY LOAM, 0 TO 3 PERCENT SLOPES	330
		rxfire Total		507
	49 Total			507
	53	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	125
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	1
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT NORTH SLOPES	0
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	0
		cs Total		126
	53 Total			126
Lake Billy Chinook Total				**3184**
Lower Crooked River Valley	22	cs_rxfire	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	4
[redacted]			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	15
			ERA SOILS, 1 TO 8 PERCENT SLOPES	1
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	223
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	9
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	293

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
			SEARLES VERY STONY LOAM, 35 TO 65 PERCENT SLOPES	1
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	14
		cs_rxfire Total		560
	22 Total			560
	23	cs_rxfire	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	1
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	155
			SEARLES VERY STONY LOAM, 35 TO 65 PERCENT SLOPES	0
		cs_rxfire Total		156
	23 Total			156
	24	cs_till_seed_f	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	188
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	10
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	73
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	0
		cs_till_seed_f Total		271
	24 Total			271
	64	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	8
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	264
		cs Total		272
	64 Total			272
Lower Crooked River Valley Total				**1259**
Mud Springs Creek	1	rxfire	ERA SOILS, 8 TO 40 PERCENT SLOPES	146
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	117
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	153
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	24
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	329
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	44
		rxfire Total		813
	1 Total			813
	2	rxfire	CURANT AND TUB SILT LOAMS, 8 TO 40 PERCENT SLOPES	0

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]			ERA SOILS, 1 TO 8 PERCENT SLOPES	52
			ERA SOILS, 8 TO 40 PERCENT SLOPES	48
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	131
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	208
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	4
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	130
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	9
		rxfire Total		583
	2 Total			583
	3	cs_rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	28
			DAY CLAY, 8 TO 40 PERCENT SLOPES	36
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	1
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	16
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	34
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	27
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	20
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	132
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	307
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	20
		cs_rxfire Total		621
	3 Total			621
	4	cs_rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	2
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	8
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	7
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	24
		cs_rxfire Total		41
	4 Total			41
	9	rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	22

Alternative D - Soils Within Treatment Areas by Watershed Name

Watershed	*Label #*	*TREATMENT*	*Soil Type*	
[redacted]			ERA SOILS, 8 TO 40 PERCENT SLOPES	62
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	41
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	18
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	35
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	303
			SIMAS VERY STONY CLAY LOAM, 35 TO 70 PERCENT SLOPES	30
		rxfire Total		511
	9 Total			511
	14	cs_rxfire	SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	0
		cs_rxfire Total		0
	14 Total			0
	44	cs_till_seed_f	CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	3
			CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	40
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	156
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	1
			MADRAS SANDY LOAM, 3 TO 8 PERCENT SLOPES	1
		cs_till_seed_f Total		204
	44 Total			204
	45	cs_till_seed_f	ERA SOILS, 1 TO 8 PERCENT SLOPES	16
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	292
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	17
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	72
		cs_till_seed_f Total		397
	45 Total			397
	46	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	3
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	1
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	30
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	53

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]		cs_till_seed_f Total		87
	46 Total			87
	55	cs	CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	194
			ERA SOILS, 8 TO 40 PERCENT SLOPES	137
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	57
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	261
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	31
		cs Total		680
	55 Total			680
	56	cs	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	36
			AGENCY LOAM, 3 TO 8 PERCENT SLOPES	6
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	7
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	22
			ERA SOILS, 1 TO 8 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	48
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	48
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	21
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	29
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	35
		cs Total		252
	56 Total			252
	57	cs	BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	43
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	7
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	13
			ERA SOILS, 8 TO 40 PERCENT SLOPES	79
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	358
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	52
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	35
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	150

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
		cs Total		740
	57 Total			740
	58	cs	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	3
			ERA SOILS, 1 TO 8 PERCENT SLOPES	16
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	196
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	17
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	125
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	277
		cs Total		634
	58 Total			634
Mud Springs Creek Total				**5563**
Steelhead	50	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	12
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	3
		cs Total		15
	50 Total			15
	51	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	76
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	12
		cs Total		88
	51 Total			88
Steelhead Total				**103**
Whychus	50	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	186
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	21
		cs Total		207
	50 Total			207
	51	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	76
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	0
		cs Total		76
	51			76

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
	Total			
	52	cs_rxfire	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	238
			AGENCY-MADRAS COMPLEX, 8 TO 15 PERCENT SLOPES	0
			REDSLIDE-LICKSKILLET COMPLEX, 15 TO 30 PERCENT NORTH SLOPES	0
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT NORTH SLOPES	18
			SIMAS-RUCKLES COMPLEX, 15 TO 40 PERCENT SOUTH SLOPES	0
		cs_rxfire Total		256
	52 Total			256
	53	cs	AGENCY-MADRAS COMPLEX, 0 TO 8 PERCENT SLOPES	168
			HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	1
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	2
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	46
		cs Total		217
	53 Total			217
	54	cs	HOLMZIE-SEARLES COMPLEX, MOIST, 0 TO 15 PERCENT SLOPES	156
			LAIDLAW SANDY LOAM, 0 TO 15 PERCENT SLOPES	4
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			SIMAS-RUCKLES-ROCK OUTCROP COMPLEX, 40 TO 80 PERCENT SOUTH SLOPES	46
		cs Total		207
	54 Total			207
Whychus Total				**963**
Willow Creek	4	cs_rxfire	ERA SOILS, 1 TO 8 PERCENT SLOPES	28
			ERA SOILS, 8 TO 40 PERCENT SLOPES	13
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	137
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	18
			MADRAS SOILS, 12 TO 40 PERCENT SLOPES	71
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	10
		cs_rxfire Total		277
	4 Total			277

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]	5	cs_rxfire	CAPHEALY-REUTER COMPLEX, 0 TO 3 PERCENT SLOPES	9
			CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	163
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	33
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	11
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	11
		cs_rxfire Total		228
	5 Total			228
	6	cs	CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	1
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	24
		cs Total		25
	6 Total			25
	7	cs_till_seed_f	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	120
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	37
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	6
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	100
			ERA SANDY LOAM, 3 TO 8 PERCENT SLOPES	0
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	0
		cs_till_seed_f Total		263
	7 Total			263
	11	cs_till_seed_f	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	3
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	98
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	47
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	78
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	37
		cs_till_seed_f Total		263
	11 Total			263
	13	rxfire	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	0
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	66

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	256
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	140
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	6
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	190
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	0
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
		rxfire Total		659
	13 Total			659
	14	cs_rxfire	CAPHEALY-REUTER COMPLEX, 15 TO 30 PERCENT SLOPES	0
			CAPHEALY-REUTER COMPLEX, 3 TO 8 PERCENT SLOPES	4
			CAPHEALY-REUTER COMPLEX, 8 TO 15 PERCENT SLOPES	6
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	2
			ERA SOILS, 1 TO 8 PERCENT SLOPES	91
			ERA SOILS, 8 TO 40 PERCENT SLOPES	118
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	9
			LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	27
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	305
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	130
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	13
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 30 TO 60 PERCENT SOUTH SLOPES	49
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	49
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	76
		cs_rxfire Total		879
	14 Total			879
	15	rxfire	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	0
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	35
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	0
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	893
		rxfire Total		928
	15 Total			928

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]	16	cs	MADRAS LOAM, 1 TO 12 PERCENT SLOPES	71
		cs Total		71
	16 Total			71
	25	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	5
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	104
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	9
			SIMAS SILT LOAM, 0 TO 15 PERCENT SLOPES	28
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	158
		rxfire Total		304
	25 Total			304
	26	rxfire	CURANT AND TUB SILT LOAMS, 40 TO 70 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	5
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 15 TO 30 PERCENT SOUTH SLOPES	8
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	44
		rxfire Total		57
	26 Total			57
	27	cs_till_seed_f	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	3
			COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	137
			ERA SOILS, 1 TO 8 PERCENT SLOPES	65
			ERA SOILS, 8 TO 40 PERCENT SLOPES	37
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	246
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	94
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	138
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	39
		cs_till_seed_f Total		759
	27 Total			759
	28	cs_till_seed_f	COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	66
			ERA SOILS, 1 TO 8 PERCENT SLOPES	1
			ERA SOILS, 8 TO 40 PERCENT SLOPES	0

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	791
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	14
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	123
		cs_till_seed_f Total		995
	28 Total			995
	29	cs_till_seed_f	AGENCY LOAM, 1 TO 12 PERCENT SLOPES	17
			COURT SANDY LOAM, 1 TO 8 PERCENT SLOPES	7
			ERA SOILS, 1 TO 8 PERCENT SLOPES	51
			ERA SOILS, 8 TO 40 PERCENT SLOPES	16
			GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	1
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	192
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	3
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	177
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	78
		cs_till_seed_f Total		542
	29 Total			542
	42	cs_till_seed_f	BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	11
			CULLIUS LOAM, 3 TO 8 PERCENT SLOPES	48
			CULLIUS LOAM, 8 TO 15 PERCENT SLOPES	180
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	229
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	3
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	37
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	90
		cs_till_seed_f Total		598
	42 Total			598
	43	cs_till_seed_f	LICKSKILLET EXTREMELY STONY LOAM, 40 TO 70 PERCENT SLOPES	1
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	135
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	11
		cs_till_seed_f Total		147

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]	43 Total			147
	58	cs	ERA SOILS, 1 TO 8 PERCENT SLOPES	22
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	0
			LICKSKILLET VERY STONY LOAM, 15 TO 40 PERCENT SLOPES	27
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	1
			SIMAS COBBLY SILTY CLAY LOAM, 10 TO 35 PERCENT SLOPES	119
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	81
		cs Total		250
	58 Total			250
	59	cs	BAKEOVEN VERY COBBLY LOAM, 0 TO 3 PERCENT SLOPES	408
			BAKEOVEN VERY COBBLY LOAM, 2 TO 20 PERCENT SLOPES	97
			CULLIUS LOAM, 0 TO 3 PERCENT SLOPES	151
			ERA SANDY LOAM, COBBLY SUBSTRATUM, 0 TO 3 PERCENT SLOPES	2
			LICKSKILLET-REDCLIFF VERY GRAVELLY LOAMS, 0 TO 15 PERCENT SLOPES	300
			LICKSKILLET-ROCK OUTCROP COMPLEX, 45 TO 80 PERCENT SLOPES	1
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	4
		cs Total		963
	59 Total			963
	60	cs	GRIBBLE COBBLY LOAM, 5 TO 20 PERCENT SLOPES	615
			MADRAS LOAM, 1 TO 12 PERCENT SLOPES	203
		cs Total		818
	60 Total			818
	63	cs	ERA SOILS, 8 TO 40 PERCENT SLOPES	12
			LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	46
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	529
			METOLIUS SANDY LOAM, 0 TO 8 PERCENT SLOPES	16
			SIMAS SOILS, 8 TO 40 PERCENT SLOPES	434
		cs Total		1037
	63 Total			1037

Alternative D - Soils Within Treatment Areas by Watershed Name				
Watershed	***Label #***	***TREATMENT***	***Soil Type***	
[redacted]	64	cs	LAMONTA COBBLY LOAM, 1 TO 12 PERCENT SLOPES	166
			MCCOIN LOAM, 5 TO 20 PERCENT SLOPES	72
		cs Total		238
	64 Total			238
Willow Creek Total				**10301**
Grand Total				**29576**

Appendix R Table of Mapped Soils Series by Sub-Watershed

Table of Mapped Soils Series by sub-watershed by acres and percent of sub

The table below lists all mapped series by sub-watershed by acres and percent of sub. This is useful when comparing and contrasting subwatersheds.

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
total acres by HUC5				55942	37880	21269	58943	61581	61911	23405	20518	82653
Argixerolls	fine	Holmzie		0	0	0	0	1847=3%	0	2575=11%	3078=15%	0
Aridic Argixerolls	fine-loamy	Madras		8434 =15%	9091=24%	3615=17%	12792=22%	6158=10%	395 =1%	2341=10%	1436=7%	12398=15%
Aridic Argixerolls	loamy-skeletal	Searles		<1	0	0	0	1231=2%	6540=11%	1872 =8%	2257=11%	0
Calcic Argixerolls	clayey-skeletal	Degner		0	11	0	0	0	129	0	0	291
Lithic Argixerolls	clayey	Cullius	<20	5976 =11%	6887=18%	0	4495 =8%	1527=2%	0	0	0	2770 =3%
Lithic Argixerolls	clayey-skeletal	Ruckles	<20	560 = 1%	1136=3%	638 =3%	589 = 1%	616 =1%	0	468 =2%	615 =3%	826 =1%
Vitrandic Argixerolls	loamy-skeletal	Wilt		0	0	0	0	0	0	0	466 =2%	0
Vertic Argixerolls	fine	Tub		0	0	0	4126 =7%	0	1238=2%	0	0	4963=6%

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Durinodic Haplic Haplocambids	coarse-loamy	Prineville		0	0	0	0	0	619 =1%	0	0	0
Aridic Haploxerolls	fine-loamy	Agency		3636 = 7%	6887=18%	5104=24%	2947 =5%	7390=12%	306	2575 =11%	2052=10%	592 =1%
Aridic Haploxerolls	loamy	McCoin		0	0	0	0	0	3149 =5%	0	0	1769=2%
Aridic Haploxerolls	loamy-skeletal	Redcliff		<1%	757 =2%	0	589 =1%	0	0	702 =3%	410 =2%	826 =1%
Calcidic Haploxerolls	loamy	Donnybrook		0	0	0	0	0	1008=2%	0	0	761 =1%
Calcidic Haploxerolls	coarse-loamy	Courtrock		0	0	0	0		619 =1%	0	0	0
Calcidic Haploxerolls	loamy-skeletal	Haystack		0	0	0	0	0	0	0	0	<1%
Calcic Pachic Haploxerolls	fine-loamy	Schrier		2797 = 5%	757 = 2%	0	0	75	<1%	0	0	0
Calcic Pachic Haploxerolls	fine-silty	Curant		78 = <0.2%	30	0	2358 = 4%	0	2476=4%	0	0	500 =<1%
Cumulic Haploxerolls	fine-loamy	Willowdale		0	0	0	113	0	73	0	0	692 =1%
Cumulic Haploxerolls	coarse-silty	Powder		0	0	0	0	0	3096=5%	0	0	0

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Duridic Haploxerolls	fine-silty	Iris		1027 =2%	0	0	0	0	0	0	0	0
Lithic Haploxerolls	loamy	Stukel	<20	2238 =4%	0	0	0	0	0	3511=15%	0	0
Lithic Haploxerolls	loamy-skeletal	Bakeoven	<20	0	0	3828=18%	1768 = 3%	3695=6%	2476=4%	0	0	1136=1%
Lithic Haploxerolls	loamy-skeletal	Lickskillet	<20	6713 = 12%	1894	213= 1%	4715 = 8%	1231=2%	1857=3%	1872 =8%	6155=30%	4133=5%
Fluvaquentic Haploxerolls	coarse-loamy	Omahaling		0	0	0	0	0	0	0	313 =2%	176
Pachic Haploxerolls	fine-loamy	Utley		0	0	0	0	0	0	0	0	6
Pachic Haploxerolls	loamy-skeletal	Ginser		28	0	0	0	0	2214=4%	0	0	374
Pachic Haploxerolls	loamy-skeletal	Wrentham		0	0	0	0	0	1740=3%	0	0	0
Vitritorrandic Haploxerolls	ashy	Deskamp		0	0	0	0	0	0	93	0	0
Vitritorrandic Haploxerolls	ashy over sandy or sa-sk	Clovkamp		0	64	0	0	0	0	0	0	0

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Vitritorrandic Haploxerolls	coarse-loamy over sandy	Court		182	7	0	0	0	4321 =7%	0	0	209
Vitritorrandic Haploxerolls	coarse-loamy	Caphealy		480= 1%	1894=5%	0	2358 = 4%	616 =1%	0	0	14	3306=4%
Vitritorrandic Haploxerolls	coarse-loamy	Deschutes		3916 = 7%	0	0	0	0	32	3745=16%	0	0
Vitritorrandic Haploxerolls	coarse-loamy	Era		1600 = 3%	2473 =7%	213 =1%	7073 =12%	616 =1%	262	0	0	3306=4%
Vitritorrandic Haploxerolls	coarse-loamy	Houstake		566 = 1%	0	0	0	0	0	103	0	0
Vitritorrandic Haploxerolls	coarse-loamy	Lafollette		0	0	0	0	0	0	296 =1%	110	0
Vitritorrandic Haploxerolls	fine-loamy	Buckbert		249	0	0	0	0	0	95	0	0

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Vitritorrandic Haploxerolls	fine-loamy	Redmond		2237 = 4%	0	0	0	0	619 =1%	0	0	0
Vitritorrandic Haploxerolls	loamy over pumiceous	Tetherow		2025 = 4%	100	0	0	0	0	0	0	0
Vitritorrandic Haploxerolls	loamy	Reuter		0	1136 = 3%	0	1768 = 3%	616 =1%	0	0	10	1653=2%
Vitritorrandic Haploxerolls	loamy-skeletal	Redslide		200	0	0	0	0	0	702 =3%	410 =2%	0
Pachic Palexerolls	fine	Prag		0	0	0	0	0	0	0	0	2126=3%
Vertic Palexerolls	fine	Hankins		0	0	0	0	0	1066 =2%	0	0	8387=10%
Vertic Palexerolls	fine	Simas		1678 = 3%	3788=10%	1276 = 6%	9431 =16%	2463 =4%	12821=21%	702 =3%	1231=6%	4133=5%
Vertic Palexerolls	clayey-skeletal	Yawkey		0	0	0	0	0	400=<1%	0	0	1653=2%

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Abrubtic Argiduric Durxerolls	fine	Lamonta		0	0	0	508 =1%	0	1857= 3%	0	0	6958=8%
Haplic Durixerolls	clayey-skeletal	Gribble			14	0	1974 =3%	0	973 =2%	0	0	9607=12%
Haplic Haploxerollic Durixerolls	fine-loamy	McMeen		0	0	0	397 =1%	0	0	0	0	692 =1%
Lithic Mollic Haploxeralfs	loamy-skeletal	Thorn	<20	0	0	425 =2%	0	1232 =2%	0	0	0	0
Ultic Haploxeralfs	fine-loamy	Parrego		0	0	851 =4%	0	4926 =8%	0	0	0	0
Alfic Vitrixerands	ashy over loamy	Smiling		0	0	0	0	2463 =4%	0	0	0	0
Alfic Vitrixerands	ashy over loamy-skeletal	Windego		0	0	213= 1%	0	3695 =6%	0	0	0	0
Alfic Vitrixerands	ashy over clayey	Boardtree		0	0	0	0	0	469 =<1%	0	0	2480=3%

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Humic Vitrixerands	ashy	Wanoga		0	0	1276 =6%	0	9237=15%	0	0	3283=16%	0
Humic Vitrixerands	ashy	Laidlaw		0	0	0	0	375 =1%	0	0	1231=6%	0
Humic Vitrixerands	ashy-skeletal	Fryrear		0	0	0	0	0	0	0	40	0
Humic Vitrixerands	ashy over pumiceous or cindery	Bluesters		0	0	0	0	204	0	73	17	0
Lithic Vitrixerands	ashy	Fremkle	<20	0	0	851 = 4%	0	4926 =8%	0	0	1231 =6%	0
Lithic Vitrixerands	ashy-skeletal	Henkle	<20	0	0	425 = 2%	0	1232 =2%	0	0	60	0
Vitritorrandic Haplocambids	coarse-loamy	Metolius		0	0	0	0	0	2476 =4%	0	0	1199=1%
Chromic Haploxererts	very-fine	Day		0	0	0	192		0	0	0	216

SOIL SUBGROUP	FAMILY PARTICLE SIZE	SOIL SERIES	Depth Inches	Crooked River Grasslands	Deschutes South	Lower Metolius	Mud Springs Creek	Lake Billy Chinook	Lower Ckd Riv.V	Steelhead Falls	Whychus	Willow Creek
Xeric Vitricryands	ashy over loamy	Gap		0	0	0	0	542 =1%	0	0	0	0
Xeric Vitricryands	ashy over loamy	Prairie		0	0	0	0	542 =1%	0	0	0	0
Xeric Vitricryands	ashy over loamy-skeletal	Glaze		0	0	0	0	0	0	0	0	0
Typic Vitritorrands	ashy over loamy-skeletal	Plainview		0	0	0	0	0	0	50	0	0
Typic Vitritorrands	ashy over sandy or sa-sk	Clinefalls		0	0	0	0	0	0	178	0	0
Cumulic Endoaquolls	fine silty over sandy or sa-sk	Boyce		0	0	0	0	0	2476 =4%	0	0	0

Appendix S Table Of Estimated Tillage Suitablity

Table Of Estimated Tillage Suitablity

Tillage to 12 inches with large discs or forest cultivator type implements. Any of these series with slope classes over 20 percent are unsuited for tillage.

SOIL SERIES	DEPTH	ROCK % >35%	CLAYEY	SCABLAND	TILLAGE SUITABILITY
AGENCY					HIGH
BAKEOVEN	<20 INCHES	LO-SKELETAL		YES	NONE
BLUESTERS					MODERATE
BOARDTREE					HIGH
BOYCE					HIGH
BUCKBERT					HIGH
CAPHEALY					HIGH
CLINEFALLS					HIGH
CLOVCAMP					HIGH
COURT					HIGH
COURTROCK					HIGH
CULLIUS	<20 INCHES		YES		MODERATE
CURANT					HIGH
DAY			YES (VFine)		NONE
DEGNER		CL-SKELETAL	YES		LOW
DESCHUTES					HIGH
DESKAMP					HIGH
DONNYBROOK					HGIH
ERA					HIGH
FREMKLE	<20 INCHES				LOW
FRYREAR		ASHY-SKELETAL			LOW
GAP					HIGH
GINSER		LO-SKELETAL			LOW
GLAZE					HIGH
GRIBBLE		CL-SKELETAL	YES		MODERATE
HANKINS			YES (Fine)		LOW
HAYSTACK		LO-SKELETAL			LOW
HENKLE	<20 INCHES	ASHY-SKELETAL			LOW

SOIL SERIES	DEPTH	ROCK % >35%	CLAYEY	SCABLAND	TILLAGE SUITABILITY
HOUSTAKE					HIGH
IRIS					HIGH
LAFOLLETTE					HIGH
LAIDLAW					HIGH
LAMONTA					HIGH
LICKSKILLET	<20 INCHES	LO-SKELETAL			NONE
MADRAS					HIGH
McCOIN					HIGH
McMEEN					HIGH
METOLIUS					HIGH
OMAHALING					HIGH
PARREGO					HIGH
PLAINVIEW					HIGH
POWDER					HIGH
PRAG			YES (Fine)		LOW
PRAIRIE					HIGH
PRINEVILLE					HIGH
REDCLIFF		LO-SKELETAL			LOW
REDMOND					HIGH
REDSLIDE		LO-SKELETAL			LOW
REUTER					HIGH
RUCKLES	<20 INCHES	CL-SKELETAL	YES		NONE
SCHRIER					MODERATE
SEARLES		LO-SKELETAL			LOW
SIMAS			YES (Fine)		LOW
SMILING					HIGH
STUKEL	<20 INCHES				LOW
TETHEROW					HIGH
THORN	<20 INCHES				LOW
TUB			YES (Fine)		MODERATE
UTLEY					HIGH
WANOGA					HIGH
WILLOWDALE					HIGH

SOIL SERIES	DEPTH	ROCK % >35%	CLAYEY	SCABLAND	TILLAGE SUITABILITY
WILT		LO-SKELETAL			LOW
WINDEGO					HIGH
WRENTHAM		LO-SKELETAL			LOW
YAWKEY		CL-SKELETAL	YES		LOW

<u>Appendix T</u> Table of Shallow And/Or Clay Soils

Table of Shallow And/Or Clay Soils

These soils represent a higher potential for medusahead grass invasion. Note that higher precipitation soils such as Hankins and Yawkey can support more competitive species at higher densities than other soils listed.

SOIL SERIES	DEPTH	ROCK % >35%	CLAYEY	SCABLAND	TILLAGE SUITABILITY
BAKEOVEN	<20 INCHES	LO-SKELETAL		YES	NONE
DAY			YES (VFine)		NONE
DEGNER		CL-SKELETAL	YES		LOW
GRIBBLE		CL-SKELETAL	YES		MODERATE
HANKINS			YES (Fine)		LOW
PRAG			YES (Fine)		LOW
RUCKLES	<20 INCHES	CL-SKELETAL	YES		NONE
SIMAS			YES (Fine)		LOW
TUB			YES (Fine)		MODERATE
YAWKEY		CL-SKELETAL	YES		LOW

<u>Appendix U</u> Table of Predominant Soil Series, Range site ID and Range site name

Table of Predominant Soil Series, Range site ID and Range site name

The table below shows which range/woodland sites have either been correlated or used with the above 12 predominant soil series.

SOIL SERIES	RANGE SITE ID	RANGE SITE NAME
Madras	10XA001OR	Droughtly Loam 8-10pz
	10XA018OR	Loamy 10-12
Simas	10XB022OR	JD Clayey 9-12
	10XB024OR	Droughty Clay Loam 10-12
	10XB041OR	JD Clayey South 9-12
	10XB042OR	Droughty South 9-12
	10XB045OR	JD Clayey South 12-16
	10XB084OR	Droughty North 10-12
Agency	10XA001OR	Droughty Loam 8-10
	10XA018OR	Loamy 10-12
Lickskillet	08XYZ10OR	Shallow South 10-14
	10XA007OR	South 10 -12
	10XA019OR	Droughty 8-12
	10XA025OR	Shallow North 10-12
	10XB031OR	JD Shallow 12-16
	10XB033OR	JD Shallow North 12-16
	10XB047OR	JD Shallow South 12-16
	10XB051OR	JD Shallow South 9-12
Cullius	10XA001OR	Droughty Loam 8-10
Era	10XA002OR	Pumice Hills 8-10
	10XA083OR	Sandy North 10-12
Wanoga	006XB0020	Juniper- Pine
	006XB2000	Pine- Juniper
Bakeoven	08XY1400OR	Very Shallow Loam 8-12
Gribble	10XB027OR	JD Clayey 12-16
Searles	10XA007OR	South 10-12
	10XA018OR	Loamy 10-12
	10XA019OR	Droughty 8-12
Tub	10XB016OR	JD Swale 12-16
	10XB027OR	JD Clayey 12-16
	10XB045OR	JD Clayey South 12-16
	10XB070OR	JD North 12-16

SOIL SERIES	RANGE SITE ID	RANGE SITE NAME
Hankins	06XB0020	Juniper- Pine
	06XB2000	Pine- Juniper

Appendix V Soil Series Descriptions: 12 Predominant Soil Series

Soil Series Descriptions: 12 Predominant Soil Series

LOCATION AGENCY OR
Established Series
Rev. RPM/TDT
3/92

AGENCY SERIES

The Agency series consists of moderately deep, well drained soils on terraces and plateaus. They formed in windblown deposits over volcaniclastic sediments from the Deschutes Formation. Slopes are 0 to 70 percent. The mean annual precipitation is about 10 inches and the mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, mesic Aridic Haploxerolls

TYPICAL PEDON: Agency loam - cropland, on a nearly level slopes at 2290 feet elevation. (When described (10/4/89), soil was dry throughout. Colors are for dry soil unless otherwise noted).

Ap1--0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and nonplastic; many very fine, fine, medium, and coarse roots: many very fine interstitial pores; neutral (pH 6.8); clear wavy boundary.

Ap2--4 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine roots: many very fine tubular pores; neutral (pH 6.8); clear wavy boundary. (Combined thickness of the Ap horizon is 4 to 13 inches)

AB--8 to 16 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots: many very fine tubular pores; mildly alkaline (pH 7.6); clear wavy boundary. (3 to 9 inches thick)

Bw1--16 to 24 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; many very fine tubular pores; mildly alkaline (pH 7.6); gradual wavy boundary. (6 to 12 inches thick)

Bw2--24 to 29 inches; pale brown (10YR 6/3) cobbly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and nonplastic; many very fine interstitial pores; 5 percent gravels and 10 percent cobbles; lime coatings on undersides of gravels and cobbles; moderately alkaline (pH 8.0); clear wavy boundary. (0 to 7 inches thick)

2Crkq--29 to 33 inches; paralithic tuff with silica and calcium carbonate coatings along fractures; moderately effervescent. (0 to 6 inches thick)

2R--33 inches: welded tuff of the Deschutes Formation (see Remarks)

TYPE LOCATION: Jefferson County, Oregon; about 600 feet west and 1500 feet south of the northeast corner of section 26, T. 9 S., R. 13 E.(Latitude 44 degrees, 8 minutes, 6 seconds N, Longitude 121 degrees, 45 minutes, 51 seconds W)

RANGE IN CHARACTERISTICS: The depth to basalt or tuff bedrock (lithic) is 22 to 40 inches. The soil moisture control section is usually dry and is dry in all parts for 120 to 150 days (cumulative) in the 4 months that follow the summer solstice. The mean annual soil temperature is 48 to 54 degrees F. The particle-size control section averages 18 to 27 percent clay. The mollic epipedon is 7 to 16 inches thick.

The A horizon has hue of 10YR, value of 5 dry and 3 moist, and chroma of 2 or 3 moist and dry. It is sandy loam or loam. It is neutral or mildly alkaline. It contains 10 to 30 percent glass and glass-coated aggregate and the acid oxalate extractable aluminum plus one-half the acid oxalate iron is less than 0.4 percent.

The Bw horizon has hue of 10YR, value of 6 dry and 3 or 4 moist, and 3 or 4 moist and dry. It is loam, clay loam or cobbly loam or clay loam with 15 to 30 percent clay. It contains 0 to 20 percent gravel and 0 to 25 percent cobbles. Total rock fragment content is 5 to 30 percent. It is mildly or moderately alkaline .

The 2Crkq horizon is paralithic tuff of the Deschutes Formation. This horizon is absent in some pedons.

COMPETING SERIES: These are the Capona, Lovline, Quencheroo (T), and Sutro series. Capona soils are slightly acid or neutral and lack the volcanic glass in the surface. Lovline soils are channery throughout and are moderately deep over schist. Quencheroo soils are greater than 40 inches to bedrock. Sutro soils have a paralithic contact at 20 to 40 inches and lack the lithic contact.

GEOGRAPHIC SETTING: Agency soils are on terraces and plateaus. Slopes are o to 70 percent but are typically less than 15 percent. These soils formed in medium textured eolian materials and are underlain by tuff, basalt, or other components of the Deschutes Formation. The climate is characterized by cool moist winters and hot dry summers. Elevations range from 2,000 to 3,200 feet. The mean annual precipitation is 8 to 12 inches. The mean annual temperature is 47 to 52 degrees F. The frost free period is 110 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Cullius, Era, and Madras soils. Cullius soils are on terraces and plateaus and are shallow with a clayey argillic horizon. Era soils are in swales and uplands and are deep and coarse-loamy. Madras are on terraces and plateaus and have a fine-loamy argillic horizon.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: These soils are used for irrigated cropland, pasture, and livestock grazing. Potential native vegetation is western juniper, basin big sagebrush, antelope bitterbrush, bluebunch wheatgrass, and Idaho fescue.

DISTRIBUTION AND EXTENT: Terraces and plateaus of Central Oregon; MLRA 10. The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Deschutes Irrigation Project, 1946.

REMARKS: This draft (2/92) represents a change in classification from fine-loamy, mixed, mesic Xerollic Camborthids to fine-loamy, mixed, mesic Aridic Haploxerolls based on a mollic epipedon from 0 to 16 inches.

Diagnostic horizons and features in this pedon:

mollic epipedon - the zone from the surface to 16 inches. (Ap1, Ap2, and AB horizons)

cambic horizon - the zone from 16 to 24 inches. (Bw1 and Bw2 horizons)

Deschutes Formation - semiconsolidated water-laid sediments composed of sands, gravels, and silts of volcanic origin, and reworked volcanic materials. Interbedded basalts and ash-flow tuffs are included in this formation.

ADDITIONAL DATA: Partial laboratory data are available for this soil. Reference sample S89OR-31-15 from Jefferson County, Oregon, NSSL, Lincoln, NE 05/90

National Cooperative Soil Survey
U.S.A.

Rev. AON/TDT/RWL
6/97 LOCATION BAKEOVEN OR+ID WA
Established Series

BAKEOVEN SERIES

The Bakeoven series consists of very shallow, well drained soils that formed in mixed alluvium, loess and residuum weathered from basalt. Bakeoven soils are on uplands and have slopes of 0 to 90 percent. The mean annual precipitation is about 13 inches, and the mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, mesic Lithic Haploxerolls

TYPICAL PEDON: Bakeoven very cobbly loam-rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 2 inches; brown (7.5YR 5/3) very cobbly loam, dark brown (7.5YR 3/2) moist; weak thin platy and weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine irregular pores; 40 percent rock fragments; slightly acid (pH 6.5); abrupt smooth boundary. (0 to 4 inches thick)

Bw1--2 to 4 inches; brown (7.5YR 5/3) very gravelly heavy loam, dark brown (7.5YR 3/3) moist; weak thin platy and weak fine and medium granular structure; slightly hard, friable, moderately sticky and moderately plastic; common very fine roots; common very fine irregular pores; 60 percent rock fragments; neutral (pH 6.8); abrupt smooth boundary. (2 to 6 inches thick)

Bw2--4 to 7 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) moist, moderate fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine roots;

common very fine tubular pores; 60 percent rock fragments; neutral (pH 6.9); abrupt wavy boundary. (1 to 4 inches thick)

2R--7 inches; basalt.

TYPE LOCATION: Wasco County, Oregon; 1,200 feet south and 100 feet east of center of section 7; NW1/4SE1/4 sec. 7. T. 8 S., R. 15 E.

RANGE IN CHARACTERISTICS: The soil is usually dry and is dry throughout for more than half the time (cumulative) that the soil temperature is above 41 degrees F. The mean annual soil temperature is 47 to 55 degrees F. Thickness of solum and depth to bedrock range from about 4 to 10 inches. Rock fragments commonly range from 50 to 90 percent. Organic matter ranges from 1 to 2 percent. The lower parts of some sola have coatings of carbonates on the underside of rock fragments and these coatings extend in cracks into the underlying rock. The sola have 10YR, 7.5YR or 5YR hue.

The A horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3 moist and 2 through 4 dry. It is slightly acid to slightly alkaline.

The B horizon has value the same as that of the A horizon and chroma is 2 or 3 in the upper part and 3 or 4 below depths of 6 or 7 inches in sola thicker than 7 inches. It is loam, clay loam or silt loam and averages more than 18 percent clay. This horizon has moderate fine subangular blocky through weak medium subangular blocky structure. It is slightly acid to slightly alkaline.

Clay films are on some basalt fragments in deeper sola or in the fractures in the underlying bedrock.

COMPETING SERIES: These are the Aldax, Bodell, Couleedam, Johntom, Lickskillet, Limekiln, Plaskett, Rockly and Venator series. All of these soils except Rockly are deeper than 10 inches to bedrock. Aldax and Plaskett soils have less than 18 percent clay in the particle-size control section. Bodell, Johntom, Rockly and Venator soils are usually moist. Limekiln soils have a calcic horizon. Plaskett soils have mean annual soil temperature of 55 to 58 degrees F.

GEOGRAPHIC SETTING: The Bakeoven soils are on mountains, ridgetops, hillslopes, mesas,and benches at elevations of 540 to 4,800 feet. Slopes of 2 to 20 percent are most common and the full range is from about 0 to 90 percent. The soils formed in loess and residuum weathered from basalt. The climate is semiarid. The mean annual precipitation ranges from 9 to 16 inches, the mean annual temperature is from 45 to 53 degrees F, the mean winter temperature is from 31 to 35 degrees F, and the mean summer temperature is from 62 to 66 degrees F. The frost-free period is 100 to 180 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the competing Lickskillet soils and the Anderly, Agency, Cantala, Condon, Gem, Maupin, Morrow, Reywat, Ritzville, Ruckles, Starbuck, Walla Walla, Wapinitia, Watama and Wrentham soils. Agency soils are moderately deep to bedrock and have less than 35 percent rock fragments. Anderly and Condon soils are moderately deep and formed in loess over bedrock and in many places are "biscuits" associated with Bakeoven soils. Cantala soils are fine-silty and deeper than 40 inches to bedrock. Gem and Morrow soil have an argillic horizon and are moderately deep to bedrock. Maupin soils have a duripan and are fine-loamy. Reywat soils are shallow and have a skeletal argillic horizon. Ritzville and Walla Walla soils are deep or very deep, formed in loess and are free of rock fragments. Ruckles soils have a

very stony argillic horizon. Starbuck soils are on steep south-facing slopes, lack a mollic epipedon, formed mostly in loess and contain less than 35 percent rock fragments. Wapinitia soils are deep and have an argillic horizon. Watama soils are moderately deep and are fine-loamy. Wrentham soils are on steep north-facing slopes and are deeper than 20 inches to bedrock.

DRAINAGE AND PERMEABILITY: Well drained; moderately slow permeability. In a few places the soil is ponded for short periods.

USE AND VEGETATION: Bakeoven soils are used for livestock grazing and wildlife habitat. Native vegetation is Sandberg bluegrass, and stiff sagebrush.

DISTRIBUTION AND EXTENT: North-central Oregon, eastern Washington and southwestern Idaho; MLRA 8, 10. This series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Sherman County, Oregon; 1962.

REMARKS: Diagnostic horizons and other features:

Aridic soil moisture regime
Mollic epipedon from 0 to 7 inches

National Cooperative Soil Survey
U.S.A.

LOCATION CULLIUS OR
Established Series
REV: RPM/TDT
4/98
CULLIUS SERIES

The Cullius series consists of shallow, well drained soils on terraces and plateaus. They formed in fine-textured colluvium over semiconsolidated sediments and welded tuff from the Deschutes Formation. Slopes are 0 to 15 percent. The mean annual precipitation is about 10 inches and the mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Clayey, smectitic, mesic Lithic Argixerolls

TYPICAL PEDON: Cullius loam - cropland, on a 3 percent west-facing slope at 2700 feet elevation. (When described (10/10/89), the soil was dry throughout. Colors are for dry soil unless otherwise noted.)

Ap--0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine interstitial pores; neutral (pH 7.2); abrupt smooth boundary.

A--3 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine interstitial pores; neutral (pH 7.3); clear wavy boundary. (Combined thickness of the A horizon is 3 to 11 inches)

2Bt1--6 to 9 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, firm, nonsticky and slightly plastic; few fine roots; many very fine tubular pores; few faint clay films in pores and ped faces; 30 percent clay (estimated); 10 percent gravel; slightly alkaline (pH 7.4); clear wavy boundary.

2Bt2--9 to 17 inches; grayish brown (10YR 5/2) clay, dark yellowish brown (10YR 3/4) moist; moderate coarse prismatic structure; hard, firm, sticky and plastic; few very fine tubular pores; many prominent clay films in pores and ped faces; 60 percent clay (estimated); 10 percent cobbles; slightly alkaline (pH 7.8); abrupt smooth boundary. (Combined thickness of the 2Bt is 7 to 13)

2Crkq--17 to 18 inches; fractured tuff; common medium discontinuous veins of silica and calcium carbonate; effervescent. (0 to 4 inches thick)

2R--18 inches: welded tuff of the Deschutes Formation (see Remarks)

TYPE LOCATION: Jefferson County, Oregon; 500 feet north and 500 feet west of the southeast corner of the southwest quarter of section 17, T.12 S., R.13 E.(Latitude 44 degrees, 31 minutes, 21 seconds N, Longitude 121 degrees, 10 minutes, 9 seconds W)

RANGE IN CHARACTERISTICS: The solum thickness and depth to bedrock is 10 to 20 inches. The soil moisture control section is usually dry, it is dry in all parts for 120 to 150 days (cumulative) in the 4 months that follow the summer solstice. The mean annual soil temperature is 48 to 54 degrees F. The particle-size control section averages 35 to 50 percent clay.

The A horizon has hue of 10YR, value of 5 dry and 2 or 3 moist, and chroma of 2 or 3 moist and dry. It contains 10 to 30 percent volcanic glass and glass-coated aggregates. It is neutral to slightly alkaline.

The 2Bt horizon has hue of 10YR, value of 5 dry and 3 moist, and chroma of or 3 dry and 3 or 4 moist. It contains 0 to 10 percent gravel and 0 to 10 percent cobbles. It contains 0 to 10 percent total rock fragments. The lower part of the 2Bt has medium to coarse prismatic structure.

The 2Crkq horizon has discontinuous silica cementation and secondary carbonates in the form of soft powdery lime and coatings on the fractured tuff fragments.

COMPETING SERIES: These are the Devada, Deven, Devnot (T), Dunnlake (T), and Wylo soils. Devada soils lack the 2Crkq horizon above the lithic contact, have an abrupt A/B boundary and lack the pumice ash in the surface layers. Devnot soils contain 15 to 35 percent rock fragments, have a xeric moisture regime and lack the pumice ash in the surface. Deven soils have a xeric soil moisture regime. Dunnlake soils lack the pumice ash in the surface. Wylo soils have a mean annual soil temperature of 54 to 59 degrees F. and have 15 to 35 percent rock fragments in the particle-size control section.

GEOGRAPHIC SETTING: Cullius soils are on nearly level to gently sloping terraces and plateaus. They formed in fine textured colluvium over sediments from the Deschutes Formation. The climate is characterized by cool, moist winters and hot, dry summers. Elevations range from 2500 to 3000 feet. The mean annual precipitation is 8 to 11 inches. The mean annual temperature is 47 to 52 degrees F. The frost-free period is 110 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Madras, Agency, Era, Caphealy, and Reuter soils. Madras soils are moderately deep to bedrock. Agency soils are fine-loamy and moderately deep to bedrock. Era soils are in swales and are deep. Caphealy soils are on uplands and are moderately deep to semiconsolidated sediments. Reuter soils are on uplands and are shallow to semiconsolidated sediments.

DRAINAGE AND PERMEABILITY: Well drained; permeability is slow.

USE AND VEGETATION: These soils are used for irrigated cropland and livestock grazing. Potential native vegetation is western juniper, basin big sagebrush, antelope bitterbrush, bluebunch wheatgrass, and Idaho fescue.

DISTRIBUTION AND EXTENT: Terraces and plateaus of central Oregon; MLRA 10. The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Jefferson County (Upper Deschutes River Area), Oregon, 1992.

REMARKS: Diagnostic horizons and features recognized in this pedon:

mollic epipedon - the zone from the surface to 9 inches. (A and 2Bt1 horizons)

argillic horizon - the zone from 6 to 17 inches. (2Bt1 and 2Bt2 horizons)

aridic soil moisture regime

Deschutes Formation - semiconsolidated water-laid sediments composed of sands, gravels, and silts of volcanic origin, and reworked volcanic materials. Interbedded basalts and ash-flow tuffs are included in this formation.

National Cooperative Soil Survey
U.S.A.

LOCATION ERA OR
Established Series
Rev. GLG/AON/TDT
02/1999
ERA SERIES

The Era series consists of deep and very deep, well drained soils formed in eolian material high in ash. They are

on hills and along drainageways and have slopes of 0 to 40 percent. The mean annual precipitation is about 10 inches and the mean annual temperature is about 49 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, mesic Vitritorrandic Haploxerolls

TYPIFYING PEDON: Era ashy loam, cultivated. (Colors are for dry soil unless otherwise noted.)

Ap--0 to 3 inches; grayish brown (10YR 5/2) ashy loam, very dark grayish brown (10YR 3/2) moist; weak medium platy and weak very fine granular structure; loose, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine irregular pores; 20 percent sand-size pumice; slightly alkaline (pH 7.4); clear wavy boundary. (3 to 6 inches thick)

A1--3 to 8 inches; grayish brown (10YR 5/2) ashy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic and weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; 20 percent sand-size pumice; slightly alkaline (pH 7.6); clear smooth boundary. (4 to 6 inches thick)

A2--8 to 16 inches; brown (10YR 5/3) ashy loam, dark brown (10YR 3/3) moist; weak coarse prismatic and weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many fine and very fine tubular pores; 20 percent sand-size pumice; slightly alkaline (pH 7.7); clear smooth boundary. (3 to 10 inches thick)

Bw--16 to 23 inches; brown (10YR 5/3) ashy loam, dark brown (10YR 3/3) moist; weak coarse prismatic and weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; 20 percent sand-size pumice; slightly alkaline (pH 7.8); clear smooth boundary. (7 to 15 inches thick)

Bk1--23 to 37 inches; brown (10YR 5/3) ashy sandy loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable; common very fine roots; few very fine tubular pores; slightly effervescent; 20 percent sand-size pumice; strongly alkaline (pH 8.5); gradual smooth boundary. (10 to 15 inches thick)

Bk2--37 to 48 inches; pale brown (10YR 6/3) ashy sandy loam, brown (10YR 3/3) moist; massive; soft, very friable; few very fine roots; strongly effervescent; few light gray lime seams; 5 percent lime coated gravel and cobbles; 20 percent sand-size pumice; very strongly alkaline (pH 9.2).

2Cr--48 inches; soft bedrock of the Deschutes Formation.

TYPE LOCATION: Jefferson County, Oregon; 15 feet east of the north south fence; 1,320 feet north, 1,200 feet east of SW corner section 34, T.11S., R.14E.

RANGE IN CHARACTERISTICS: The soils are dry for one-half to three-fourths of the time when the soil temperature is above 41 degrees F. the soils are dry for 90 to 120 cumulative days. The mean annual soil temperature is 48 to 52 degrees F. The particle-size control section averages 5 to 15 percent clay. Sand-sized pumice ash (glass) is 10 to 30 percent throughout and the acid oxalate extractable aluminum plus one-half the acid oxalate iron is 0.4 to 0.8 percent. Depth to carbonates is 20 to 36 inches and soft powdery secondary

carbonates are present at 30 to 44 inches. Depth to consolidated sediments, basalt or gravelly or cobbly colluvial material is 40 to over 60 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has chroma of 2 or 3 dry or moist. It is neutral or slightly alkaline. The upper part has weak, medium, platy or weak, fine, granular structure and the lower part has weak granular, prismatic or subangular blocky structure.

The Bw and Bk1 horizon has value of 5 or 6 dry and 3 or 4 moist. It is ashy sandy loam or ashy loam and has weak prismatic, weak subangular blocky structure or is massive. It is neutral to strongly alkaline.

The Bk2 horizon has value of 5 or 6 dry and 3 or 4 moist and chroma of 2 to 4 moist and dry. It is ashy sandy loam or ashy loam and contains 0 to 50 percent rock fragments. It is slightly to very strongly alkaline.

COMPETING SERIES: These are the Caphealy, Deschutes, Houstake and Lafollette series. Caphealy and Deschutes soils are 20 to 40 inches to bedrock. Houstake soils have a hard, firm, brittle layer at 20 to 40 inches. Lafollette soils are 20 to 30 inches deep to sand and gravel.

GEOGRAPHIC SETTING: Era soils are on hills and along drainages at elevations of 2,000 to 4,000 feet. Slopes are 0 to 40 percent. These soils formed in moderately coarse and medium textured eolian materials of mixed origin high in ash. The climate is semiarid, with hot, dry summers and cold, moist winters. The mean annual precipitation is 8 to 12 inches. The mean summer temperature is 61 to 65 degrees F.; the mean winter temperature is 32 to 36 degrees F.; and the mean annual temperature is 46 to 52 degrees F. The frost free period is 70 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Agency, Haystack, Lamonta, Metolius, Madras, and McCoin soils. Agency and Madras soils are 20 to 40 inches deep to bedrock and are fine-loamy. Haystack soils are loamy-skeletal. Lamonta soils have a clayey argillic horizon. Metolius soils have an ochric epipedon. McCoin soils are less than 20 inches deep to a paralithic contact.

DRAINAGE AND PERMEABILITY: Well to somewhat excessively drained; moderately rapid permeability.

USE AND VEGETATION: These soils are used for livestock grazing, pasture, and small grains. Potential native plants are needleandthread, Idaho fescue, basin big sagebrush and antelope bitterbrush.

DISTRIBUTION AND EXTENT: Central Oregon; MLRA 10, pumice zone. The series is inextensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Jefferson County, Oregon; Trout Creek-Shaniko Area, 1970.

REMARKS: Diagnostic horizons and other features: -Mollic epipedon- the zone from 0 to 16 inches (Ap, A1, A2 horizons)
-Cambic horizon- the zone from 16 to 37 inches (Bw and Bk1 horizons)
-Soft secondary carbonates from 37 to 48 inches (Bk2 horizon)

ADDITIONAL DATA: Oregon State University S68-16-5-(1-6) and NSSL S89OR-31-13.

National Cooperative Soil Survey
U.S.A.

LOCATION GRIBBLE OR
Established Series
Rev. GLG/AON/TDT
02/1999
GRIBBLE SERIES

The Gribble series consists of moderately deep to a duripan well drained soils on footslopes. Slopes are 5 to 20 percent. The mean annual precipitation is about 13 inches and the mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Clayey-skeletal, smectitic, mesic Haplic Durixerolls

TYPIFYING PEDON: Gribble cobbly loam, range. (Colors are for moist soil unless otherwise noted.)

A1--0 to 3 inches; black (10YR 2/1) cobbly loam, dark gray (10YR 4/1) dry; weak thin platy and moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 10 percent pebbles and 15 percent cobbles; slightly acid (pH 6.4); clear wavy boundary. (3 to 6 inches thick)

A2--3 to 10 inches; black (10YR 2/1) cobbly clay loam, very dark gray (10YR 3/1) dry; moderate very fine and fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine tubular pores; 10 percent pebbles and 20 percent cobbles; neutral (pH 6.6); clear wavy boundary. (4 to 8 inches thick)

Bt--10 to 15 inches; very dark gray (10YR 3/1) very cobbly clay, dark gray (10YR 4/1) dry; strong medium and fine blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine and medium roots; many very fine tubular pores; thick continuous clay films or pressure faces; 30 percent cobbles and 15 percent pebbles; neutral (pH 6.6); clear irregular boundary. (4 to 10 inches thick)

Btss--15 to 27 inches; dark grayish brown (10YR 4/2) very cobbly clay, grayish brown (10YR 5/2) dry; strong medium blocky structure; extremely hard, friable, very sticky and very plastic; common very fine and medium roots; many very fine tubular pores; prominent continuous very dark grayish brown (10YR 3/2) clay films; 30 percent cobbles and 15 percent pebbles; few slickensides that do not intersect; neutral (pH 7.0); clear irregular boundary. (7 to 15 inches thick)

Btkss--27 to 30 inches; dark brown (10YR 4/3) very cobbly silty clay, brown (10YR 5/3) dry; moderate medium subangular blocky structure; extremely hard, friable, moderately sticky and moderately plastic; common fine roots; many very fine tubular pores; prominent continuous clay films or pressure faces; few slickensides; thick lime coatings on lower ped surfaces and under rock fragments; 35 percent cobbles and 20 percent pebbles; slightly effervescent; slightly alkaline (pH 7.8); clear irregular boundary. (0 to 6 inches thick)

Btk--30 to 37 inches; yellowish brown (10YR 5/4) very cobbly clay loam, light yellowish brown (10YR 6/4) dry; massive; very hard, very firm, moderately sticky and moderately plastic; few very fine roots; many very

fine tubular pores; prominent clay films in pores; 20 percent pebbles and 40 percent cobbles; mycelial like lime veins and lime deposits on lower sides of fragments; strongly calcareous; moderately alkaline (pH 8.0); clear smooth boundary. (3 to 8 inches thick)

2Bqm--37 to 43 inches; brown (10YR 4/3) silica cemented gravelly and cobbly duripan, very pale brown (10YR 7/3) dry; massive; weakly and strongly cemented, very hard, very firm; about 1/3 of surface of duripan indurated and coated with opal or opal and sesquioxides.

TYPE LOCATION: Jefferson County, Oregon; 100 feet west of BPA power pole number 4 in the NW1/4 NE1/4 SE1/4 section 13, T.13S., R.14E.

RANGE IN CHARACTERISTICS: These soils are usually moist but are dry for 70 to 90 consecutive days between depths of 4 and 12 inches within the 3 month period following the summer solstice. The mean annual soil temperature is 47 to 49 degrees F. Depth to duripan is 20 to 40 inches.

The A horizon has value of 3 through 5 dry and 2 or 3 moist. It is cobbly clay loam, cobbly silty clay loam or cobbly loam. This horizon has weak platy to moderate granular and very fine and fine subangular blocky structure. It has 10 to 25 percent cobbles and 10 to 20 percent gravel.

The Btss and Btkss horizon has value of 4 or 5 dry and 3 or 4 moist, and chroma of 2 or 3. It is very cobbly clay or silty clay with 40 to 60 percent clay and has moderate or strong blocky or subangular blocky structure. It has 20 to 35 percent cobbles and 15 to 25 percent gravel.

The 2Btk horizon has value of 6 or 7 dry and 4 or 5 moist, and chroma of 2 through 4. It has 30 to 40 percent cobbles and 15 to 25 percent pebbles.

The 2Bqm horizon is weakly to strongly cemented, massive or platy, and less than 1/2 of the surface of the duripan is coated with opal or opal and sesquioxides.

COMPETING SERIES: There are no competing series.

GEOGRAPHIC SETTING: These soils are on gently sloping to moderately steep pediments at elevations of 3,300 to 3,900 feet. Slope gradients range from fine textured sediments mixed with rhyolite and basalt colluvium. The climate is semiarid with cool dry summers and cold moist winters; the mean annual temperature is 45 to 47 degrees F.; the mean summer temperature is 61 to 63 degrees F.; and the mean winter temperature is 30 to 33 degrees F. The mean annual precipitation ranges from 12 to 14 inches. The average frost free period is 50 to 70 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Degner, McMeen, and Tub soils. Degner and Tub soils lack duripans. McMeen soils have cambic horizons with less than 35 percent coarse fragments.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; very slow permeability.

USE AND VEGETATION: Used primarily for range with some cropland. Native vegetation is dominated by Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass.

DISTRIBUTION AND EXTENT: Central Oregon; MLRA 10, John Day area. The series is of moderate extent.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Jefferson County (Trout Creek, Shaniko Area), Oregon, 1970.

REMARKS: Diagnostic horizons and other features:

Mollic epipedon - 0 to 10 inches

Argillic horizon - 10 to 37 inches

Duripan - 37 to 43 inches, strongly cemented

National Cooperative Soil Survey
U.S.A.

LOCATION HANKINS OR
Established Series
Rev. ELD/AON/TDT
12/2000
HANKINS SERIES

The Hankins series consists of deep and very deep, well drained soils that formed in residuum and colluvium from rhyolite and tuff with ash in the upper part. Hankins soils are on hills and have slopes of 1 to 70 percent. The mean annual precipitation is about 20 inches and the mean annual temperature is about 42 degrees F.

TAXONOMIC CLASS: Fine, smectitic, frigid Vertic Palexerolls

TYPICAL PEDON: Hankins silty clay loam, woodland. (Colors are for moist soil unless otherwise noted.)

Oi--0 to 1 inch; slightly decomposed needles and twigs.

A1--1 to 6 inches; very dark brown (10YR 2/2) ashy silty clay loam, grayish brown (10YR 5/2) dry; weak thin platy structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; common fine irregular pores; slightly acid (pH 6.4); abrupt smooth boundary. (3 to 8 inches thick)

A2--6 to 11 inches; very dark brown (10YR 2/2) ashy silty clay loam, grayish brown (10YR 5/2) dry; strong fine subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine roots; few fine and common very fine tubular pores; neutral (pH 6.6); abrupt smooth boundary. (4 to 11 inches thick)

2Bt1--11 to 17 inches; very dark brown (10YR 2/3) clay, dark brown (10YR 4/3) dry; weak medium prismatic structure parting to moderate fine and medium blocky; extremely hard, very firm, very sticky and very plastic;

common very fine and fine roots; few fine and common very fine tubular pores; continuous moderately thick clay films or pressure faces on faces of peds; neutral (pH 6.6); clear smooth boundary. (5 to 10 inches thick)

2Bt2--17 to 28 inches; dark brown (10YR 3/3) clay, brown (10YR 5/3) dry; weak medium prismatic structure parting to moderate subangular blocky; very hard, very firm, very sticky and very plastic; common very fine and fine roots; few fine and very fine tubular pores; continuous moderately thick very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral (pH 6.6); clear smooth boundary. (5 to 15 inches thick)

2Bt3--28 to 36 inches; dark brown (10YR 4/3) clay, brown (10YR 5/3) dry; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common very fine tubular pores; common moderately thick dark yellowish brown (10YR 3/4) clay films in pores and few thin on faces of peds; slightly acid (pH 6.4); gradual wavy boundary. (0 to 15 inches thick)

2Bt4--36 to 46 inches; brown (10YR 5/3) clay, very pale brown (10YR 7/3) dry; moderate medium and fine subangular blocky structure; slightly brittle when moist, crushes with moderate pressure; very hard, firm, moderately sticky and moderately plastic; few fine roots; few fine tubular pores; few thin dark brown (10YR 4/3) clay films on peds and common moderately thick clay films in pores; moderately acid (pH 6.0); gradual wavy boundary. (0 to 15 inches thick)

2Bt5--46 to 55 inches; brown (10YR 5/3) clay, very pale brown (10YR 7/3) dry; moderate fine and very fine subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few fine roots; few fine and very fine tubular pores; common moderately thick dark brown (10YR 4/3) clay films in pores; neutral (pH 6.8).

TYPE LOCATION: Grant County, Oregon; 8 miles north of Dayville on Franks Creek road; on section line and 1,570 feet south of NW corner of sec. 33, T. 11 S., R. 27 E.

RANGE IN CHARACTERISTICS: The mean annual soil temperature ranges from 42 to 47 degrees F. The soils are usually moist but are dry between depths of 4 and 12 inches for 60 to 90 consecutive days during the summer. Depth to bedrock is 40 to more than 60 inches. When bedrock is present it is paralithic. The mollic epipedon is 20 to 40 inches thick. Base saturation throughout the solum it is 75 to 95 percent by sum of bases. The solum is neutral to moderately acid.

The A horizon has value of 3 through 5 dry, 2 or 3 moist and chroma of 1 thru 3 moist and dry. It is silt loam, loam or silty clay loam. The change in texture to the argillic horizon is abrupt with an absolute increase in clay of 15 to 20 percent. It is 7 to 14 inches thick and has 15 to 40 percent glass and acid oxalate aluminum plus one-half the acid oxalate iron is 0.2 to 0.5 percent. It has 0 to 40 percent gravel, 0 to 30 percent cobbles and 0 to 10 percent slopes.

Some pedons have a 3 to 8 inch thick Bw horizon consisting of clay loam or silty clay loam.

The 2Bt horizon has hue of 10YR or 5YR, moist value of 2 or 3 in the upper part, 3 or 4 in the lower part and dry value of 4 or 5 in the upper part and 5 through 7 in the lower part. It is clay or silty clay and has 45 to 60 percent clay. It has weak or moderate prismatic structure parting to moderate or strong subangular or angular blocky. It has 0 to 20 percent gravel, 0 to 30 percent cobbles and 0 to 5 percent stones.

COMPETING SERIES: These are the Booth, Campcreek, Carryback, Crowcamp, Jesh (T), Lacrol, Tippett and Zumwalt series. All of these series lack an O horizon, have a mollic epipedon less than 20 inches thick except Crowcamp and lack vitrandic properties in the surface layer.

GEOGRAPHIC SETTING: Hankins soils are on hills at elevations of from 2,500 to 5,200 feet. Slopes are 1 to 70 percent. These soils formed in residuum and colluvium from rhyolite and tuff with an influence of volcanic ash in the upper part. The climate is subhumid with a mean annual precipitation of 16 to 30 inches. Mean annual air temperature is 40 to 45 degrees F, mean July temperature is about 58 to 62 degrees F, and mean January temperature is 27 to 32 degrees F. The frost-free period is about 20 to 90 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Alding, Boardtree, McGarr, Tolo and Yawkey soils. Alding soils are shallow to bedrock. Boardtree and Tolo have surface soils formed in volcanic ash. McGarr soils are 20 to 40 inches deep to bedrock. Yawkey soils are clayey-skeletal.

DRAINAGE AND PERMEABILITY: Well drained; medium to rapid runoff; slow permeability.

USE AND VEGETATION: Used mainly for timber production and for grazing. Native plants are ponderosa pine, Douglas fir, elksedge and Idaho fescue. This series is characterized by what is called the moist and dry ponderosa pine forest plant communities.

DISTRIBUTION AND EXTENT: Mountainous areas of east-central Oregon; MLRA 43. The series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Grant County (Trout Creek-Shaniko Area), Oregon; 1970.

REMARKS: Diagnostic horizons and other features:

Xeric moisture regime
Mollic epipedon - 1 to 28 inches
Argillic horizon - 11 to 55 inches
Pale feature - abrupt textural change at 11 inches with an absolute increase in clay content of 20 percent.
Vitrandic feature - (Al + 1/2 Fe x 60) + glass is about 39 from 1 to 11 inches.
Pachic feature - mollic epipedon is 27 inches thick
Vertic subgroup - the calculate LE is over 6.0 centimeters within the upper meter.

The soil has base saturation of more than 75 percent by sum of bases throughout the solum. This is based on several lab. Sample pedons.

ADDITIONAL DATA: Reference samples - Umatilla County; 84T7170-7173; 82T7689-7691 and Grant County S74OR-023-001.

National Cooperative Soil Survey
U.S.A.

LOCATION LICKSKILLET OR+ID WA
Established Series
Rev. AON/TDT/RWL
2/98
LICKSKILLET SERIES

The Lickskillet series consists of shallow, well drained soils that formed in stony colluvium consisting of loess, rock fragments and residuum weathered from basalt and rhyolite. Lickskillet soils are on uplands and have slopes of 0 to 120 percent. The mean annual precipitation is about 12 inches, and the mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, mesic Lithic Haploxerolls

TYPICAL PEDON: Lickskillet very stony loam - rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 4 inches; brown (10YR 5/3) very stony loam, dark grayish brown (10YR 3/2) moist; weak thin platy structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine irregular pores; 20 percent basalt gravel; 10 percent cobbles and 20 percent stones on surface; neutral (pH 6.9); clear wavy boundary. (3 to 8 inches thick)

BA--4 to 9 inches; brown (7.5YR 5/3) gravelly loam, dark brown (7.5YR 3/3) moist; weak and moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; 25 percent basalt gravel and 5 percent cobbles; neutral (pH 7.2); abrupt wavy boundary. (3 to 8 inches thick)

Bw1--9 to 13 inches; brown (7.5YR 5/4) very gravelly loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky and moderately plastic; common very fine roots; common very fine tubular pores; 30 percent basalt gravel and 20 percent cobbles; neutral (pH 6.8); clear wavy boundary. (3 to 8 inches thick)

Bw2--13 to 19 inches; brown (7.5YR 5/4) extremely gravelly clay loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, firm moderately sticky and moderately plastic; common very fine roots; common very fine tubular pores; 40 percent basalt gravel and 25 percent cobbles; neutral (pH 6.6); abrupt wavy boundary. (1 to 10 inches thick)

2R--19 inches; basalt.

TYPE LOCATION: Sherman County, Oregon; about 200 feet downslope from road in the NE1/4SW1/4NW1/4 sec. 6, T. 4 S., R. 15 E.

RANGE IN CHARACTERISTICS: The soil is dry for one-half to three-fourths of the time when the soil temperature is above 41 degrees F; dry for minimum of 90 consecutive days. The mean annual soil temperature is 47 to 54 degrees F. Thickness of solum and depth to bedrock is 12 to 20 inches. Some pedons have free carbonates in coatings on the lower sides of rock fragments and extending into cracks in the underlying rock. The solum has 10YR or 7.5YR hue.

The A horizon has value of 4 or 5 dry, 2 or 3 moist and chroma of 2 or 3 dry or moist. The fine-earth textures are loam, sandy loam, and silt loam. Rock fragment content is 5 to 70 percent and are dominantly stones and cobbles. Organic matter ranges from 1 to 2 percent. Combined thickness of the A and BA horizons is 7 to 15 inches. It is slightly acid to moderately alkaline.

The Bw horizon has value of 4 to 6 dry and 3 to 5 moist and chroma is 2 to 4 dry or moist. It is loam, silt loam, clay loam, sandy clay loam, fine sandy loam, or sandy loam and averages more than 18 percent clay and 35 to 85 percent rock fragments dominantly cobbles and gravel. It has moderate fine or medium subangular blocky or weak medium subangular blocky structure. Some pedons have a thin Btk or Bt horizon with clay films on some rock fragments, in pores and extending into fractures in the bedrock. It is neutral to moderately alkaline.

COMPETING SERIES: These are the Aldax, Bakeoven, Bodacious (T), Bodell, Couleedam, Hendap (T), Johntom, Limekiln, Plaskett, Rockly and Venator series. Aldax, Couleedam, and Plaskett soils have less than 18 percent clay in the particle-size control section. Bakeoven and Rockly soils are less than 12 inches deep to bedrock. Bodacious soils are usually dry in some part of the moisture control section for 45 to 70 days during the 120 days following the summer solstice. Bodell, Johntom, Rockly and Venator soils are usually moist. Hendap soils have 6 to 12 percent clay in the control section and have a calcium carbonate equivalent ranging from 1 to 10 percent throughout the profile. Plaskett soils have mean annual soil temperature of 55 to 58 degrees F. Limekiln soils have a calcic horizon at 7 to 12 inches.

GEOGRAPHIC SETTING: The Lickskillet soils are typically on south-facing canyon and mountain side slopes at elevations of 200 to 4,500 feet. In eastern and northcentral Washington, it is on benches, shoulders of plateaus, hills, and ridgetops. Slope gradients are commonly 40 to 70 percent and range from about 0 to 120 percent. The soils formed in shallow stony colluvium mixed with loess and rock fragments weathered from the underlying basalt or rhyolite. Some pedons in northcentral Washington, have minor amounts of glacial till mixed into the soil profile. The climate is characterized by cool wet winters and hot dry summers. The mean annual precipitation is typically 9 to 14 inches but ranges up to 20 inches on south slopes in MLRA 43. The mean annual temperature is 45 to 52 degrees F, mean winter temperature is 31 to 35 degrees F, and mean summer temperature is 62 to 66 degrees F. The frost-free period is 80 to 200 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Ritzville and Walla Walla soils formed in deep loess and the Bakeoven, Cantala, Condon, Curant, Gem, Morrow, Redcliff, Ruckles, Starbuck and Wrentham soils. Cantala, Condon, Curant and Morrow soils have sola that contain only small amounts of rock fragments and are deeper than 20 inches to bedrock. Gem, Morrow and Ruckles soils have an argillic horizon. Starbuck soils have a light colored A horizon. Wrentham soils are on north-facing slopes and are deeper than 20 inches to bedrock. Redcliff soils are 20 to 40 inches deep to bedrock.

DRAINAGE AND PERMEABILITY: Well drained; moderate permeability.

USE AND VEGETATION: Most of the soil is used for livestock grazing. Other uses include watershed, recreation, and wildlife habitat. Vegetation is bluebunch wheatgrass, Sandberg bluegrass, Thurber needlegrass, western yarrow, and Wyoming big sagebrush.

DISTRIBUTION AND EXTENT: Eastern Oregon, eastern and northcentral Washington and southern Idaho; MLRA 6, 8, 10, and 43. The series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Sherman County, Oregon; 1961.

REMARKS: Diagnostic horizons and features recognized in this pedon include:

Mollic epipedon - from the surface to 9 inches (A and BA horizons).

Cambic horizon - from 9 to 19 inches (Bw1 and Bw2 horizons).

Lithic contact - 19 inches

PSCS - from 10 to 19 inches

Aridic soil moisture regime

National Cooperative Soil Survey
U.S.A.

Rev: RPM/ LOCATION MADRAS OR+ID
Established Series
TDT
03/98
MADRAS SERIES

The Madras series consists of moderately deep, well drained soils on upland terraces and plateaus. They formed in windblown deposits over volcaniclastic sediments from the Deschutes Formation. Slopes are 0 to 40 percent. The mean annual precipitation is about 10 inches and the mean annual temperature is about 48 degrees F.

TAXONOMIC CLASS: Fine-loamy, mixed, superactive, mesic Aridic Argixerolls

TYPICAL PEDON: Madras loam - cropland, on nearly level irrigated field at 2400 feet elevation. (When described (10/18/89), the soil was dry throughout. Colors are for dry soil unless otherwise noted.)

Ap1--0 to 4 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine interstitial pores; neutral (pH 6.8); abrupt smooth boundary.

Ap2--4 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate coarse platy structure; hard, friable, nonsticky and nonplastic; common very fine roots; many very fine interstitial pores; neutral (pH 6.8); abrupt smooth boundary. (Combined thickness of the Ap horizon is 7 to 14 inches)

Bt1--10 to 16 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, nonsticky and nonplastic; many very fine roots; many very fine

tubular pores; few faint clay films lining pores and on faces of peds; 25 percent clay (estimated); neutral (pH 7.2); clear smooth boundary.

Bt2--16 to 23 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; common prominent clay films lining pores and on faces of peds; 35 percent clay (estimated); mildly alkaline (pH 7.6); clear wavy boundary. (Combined thickness of the Bt horizon is 8 to 20 inches)

2Crk--23 to 27 inches; consolidated gravel, cobble, and sand sediments of the Deschutes Formation, moderately effervescent with carbonates along fractures. (2 to 6 inches thick) (See Remarks)

2R--27 inches; basalt.

TYPE LOCATION: Jefferson County, Oregon; 100 feet east and 50 south of the northwest corner of the southwest quarter of the southwest quarter of section 23, T. 10 S., R. 13 E. (Latitude 44 degrees, 40 minutes, 57 seconds N, Longitude 121 degrees, 8 minutes, 31 seconds W)

RANGE IN CHARACTERISTICS: The depth to basalt or tuff bedrock (lithic) is 22 to 40 inches. The soil moisture control section is usually dry and is dry in all parts for 120 to 150 days (cumulative) in the 4 months that follow the summer solstice. The mean annual soil temperature is 48 to 54 degrees F. The mollic epipedon is 7 to 14 inches thick. The particle-size control section averages 25 to 35 percent clay.

The A horizon has hue of 10YR, value of 5 dry and 3 moist, and chroma of 3 dry and 2 or 3 moist. It is sandy loam and loam. It is neutral or mildly alkaline. It contains 10 to 30 percent glass and glass-coated aggregate and has an acid oxalate extractable aluminum plus one-half the acid oxalate iron of less than 0.4 percent.

The Bt horizon has hue of 10YR, value of 5 dry and 3 moist, and chroma of 4 dry and moist. It is loam, clay loam, or cobbly loam or clay loam. Rock fragment content ranges from 0 to 20 percent gravel and 0 to 25 percent cobbles. Total rock fragments range from 5 to 30 percent. It is neutral to moderately alkaline.

COMPETING SERIES: These are the Bissell, Bjork, Cowiche, Dodes, Indiano, Margerum, Noslo, Orr, Pahrange, Simcoe, Springmeyer, Truax(T), Uhaldi, and Wenatchee series. Bissell, Cowiche, Margerum, Orr, Springmeyer, Truax, and Wenatchee soils are greater than 40 inches to bedrock. Bjork, Noslo, Pahrange, and Uhaldi soils lack the lithic contact below the paralithic layer. Indiano soils are slightly acid or neutral, typically have a stony or very stony surface and have formed in colluvium from rhyolitic rocks. Simcoe soils lack the thin paralithic layer above the lithic rock.

GEOGRAPHIC SETTING: Madras soils are on nearly level to hilly uplands, terraces, and plateaus. Slopes are 0 to 40 percent but are typically less than 15 percent. These soils formed in medium textured eolian materials and are underlain by gravels and basalt of the Deschutes Formation. The climate is characterized by cool, moist winters and hot, dry summers. Elevations range from 2000 to 3,200 feet. The mean annual precipitation is 8 to 12 inches. The mean annual temperature is 47 to 52 degrees F. The frost-free period is 110 to 140 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Agency, Cullius, and Era soils. Agency soils are on terraces and plateaus and do not have an argillic horizon. Cullius soils are on terraces and plateaus and are shallow, fine textured soils with an argillic horizon. Era soils are in swales on uplands and are deep and coarse-loamy.

DRAINAGE AND PERMEABILITY: Well drained; moderately slow permeability.

USE AND VEGETATION: These soils are used for irrigated cropland, pasture, and livestock grazing. Potential native vegetation is western juniper, mountain and basin big sagebrush, antelope bitterbrush, bluebunch wheatgrass, and Idaho fescue.

DISTRIBUTION AND EXTENT: Terraces and plateaus of Central Oregon; MLRA 10. The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Deschutes Irrigation Project, 1946.

REMARKS: Diagnostic horizons and features in this pedon:

mollic epipedon - from the soil surface to 10 inches. (Ap1 and Ap2 horizons)

argillic horizon - from 10 to 23 inches. (Bt1 and Bt2 horizons)

Deschutes Formation - semiconsolidated water-laid sediments composed of sands, gravels, and silts of volcanic origin, and reworked volcanic materials. Interbedded basalts and ash-flow tuffs are included in this formation.

This draft (2/92) reflects a change in classification from fine-loamy, mixed, mesic Xerollic Durargids based on the presence of a mollic epipedon from 0 to 10 inches and review of the duripan. The pan is considered to be geologic Deschutes Formation material.

ADDITIONAL DATA: Partial laboratory data are available for this soil. Reference sample S89OR-031-014 from Jefferson County, Oregon, NSSL, Lincoln, NE, 5/30/90.

National Cooperative Soil Survey
U.S.A.

LOCATION SEARLES OR+CA ID NV UT
Established Series
Rev. AON/TDT/RWL
8/97
SEARLES SERIES

The Searles series consists of moderately deep, well drained soils that formed in colluvium and residuum weathered from rhyolite and basalt. Searles soils are on uplands and lava plains and have slopes of 0 to 80

percent. The mean annual precipitation is about 11 inches and the mean annual temperature is about 47 degrees F.

TAXONOMIC CLASS: Loamy-skeletal, mixed, superactive, mesic Aridic Argixerolls

TYPICAL PEDON: Searles very stony loam-range. (Colors are for dry soil unless otherwise noted.)

A--0 to 3 inches; grayish brown (10YR 5/2) very stony loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure that parts to weak fine granular; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine irregular pores; 25 percent gravel; about 10 percent of the surface covered with stones and cobbles; neutral (pH 6.8); clear smooth boundary. (2 to 8 inches thick)

AB--3 to 8 inches; grayish brown (10YR 5/2) gravelly loam, very dark brown (10YR 2/2) moist; weak medium platy structure that parts to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine and medium roots; many very fine pores; 25 percent gravel and 5 percent cobbles and stones; neutral (pH 6.8); clear irregular boundary. (0 to 8 inches thick)

Bt1--8 to 18 inches; brown (10YR 4/3) very gravelly heavy loam, dark brown (10YR 3/3) moist; weak fine and medium prismatic structure that parts to moderate fine and medium subangular blocky; hard, firm, moderately sticky and moderately plastic; common very fine and few fine and medium roots; many very fine pores; few faint clay films on surfaces of peds and in pores; 50 percent gravel and 10 percent cobbles and stones; neutral (pH 7.0); gradual smooth boundary. (2 to 12 inches thick)

Bt2--18 to 25 inches; brown (10YR 5/3) extremely gravelly clay loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; hard, firm, moderately sticky and moderately plastic; common very fine and few fine and medium roots; many very fine pores; few faint clay films on surfaces of peds and in pores; 60 percent gravel and 10 percent cobbles and stones; neutral (pH 7.3); gradual smooth boundary. (4 to 18 inches thick)

C--25 to 40 inches; brown (10YR 5/3) extremely cobbly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and moderately plastic; few very fine roots; many very fine pores; 50 percent stones and cobbles and 30 percent gravel; lime on lower side of some rock fragments; neutral (pH 7.2); abrupt irregular boundary. (0 to 15 inches thick)

R--40 inches; fractured rhyolite; common moderately thick clay films on sides of fractures.

TYPE LOCATION: Crook County, Oregon; on south-facing slope north of trail; SE1/4 SW1/4 NE1/4 section 9, T. 16 S., R. 15 E.

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 47 to 54 degrees F. The soils are continuously dry between depths of 4 and 12 inches during the 3-month period following the summer solstice and are dry throughout between depths of 4 and 12 inches for more than half the time (cumulative) when the soil temperature is above 41 degrees F. Depth to bedrock is 20 to 40 inches and thickness of the solum is 20 to 40 inches. Rock fragments in the A horizon range from 0 to 50 percent and the Bt and C horizons average 50 to 80 percent. The percent of the surface covered with stones and cobbles ranges from 0.1 to 15 percent.

The A horizon has value of 4 or 5 dry, 2 or 3 moist, and chroma of 2 or 3 dry and moist. It is loam or sandy loam and has weak to moderate platy, granular and subangular blocky structure. It is slightly acid through slightly alkaline.

The Bt horizon has hue of 10YR or 7.5YR, and value of 4 through 6 dry and 3 through 5 moist and chroma of 3 or 4. It is heavy loam, sandy clay loam, clay loam, or silty clay loam and has 25 to 35 percent clay and more than 15 percent particles coarser than very fine sand. This horizon has weak or moderate prismatic and subangular or angular blocky structure. It is neutral or slightly alkaline.

The C horizon has value of 5 or 6 dry, 4 or 5 moist and chroma of 3 or 4 dry and moist. Some of the rock fragments in this horizon have lime coatings on the underside.

COMPETING SERIES: These are the Ashue, Badenaugh, Collard, Eaglerock, Ister, Lemm, Leviathan, Nosrac, Oest, Shree, Shroe, Tollgate, Trid, and Tristan series. All of these soils, except for Eaglerock, Ister and Trid, lack bedrock within 40 inches. Eaglerock and Trid soils have a paralithic contact at 20 to 40 inches. Ister soils have an 0 horizon and average 35 to 50 percent rock fragments in the Bt horizon.

GEOGRAPHIC SETTING: The Searles soils are on south-facing slopes of uplands and lava plains at elevations ranging from 2,000 to 6,200 feet. Slopes range from 0 to 80 percent. These soils formed in very gravelly or very cobbly medium and moderately fine textured residuum and colluvium overlying fractured rhyolite or basalt. The climate is semiarid with cool winters and warm dry summers. The mean annual precipitation is 9 to 15 inches. The mean annual temperature is 45 to 52 degrees F., mean winter temperature is 30 to 34 degrees F., and mean summer temperature is 61 to 64 degrees F. The frost-free period is 50 to 155 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Ayres, Deschutes, Holmzie, Simas and Statz soils. Ayres soils have ochric epipedons and duripans. Deschutes soils have lack an argillic horizon and are coarse-loamy. Simas soils have a clayey argillic horizons and have less than 35 percent rock fragments. Statz soils have a duripan at 10 to 20 inches and are nonskeletal.

DRAINAGE AND PERMEABILITY: Well drained; moderately slow permeability.

USE AND VEGETATION: Searles soils are used for livestock grazing and wildlife habitat. The potential native plants are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, Wyoming big sagebrush, antelope bitterbrush and western juniper.

DISTRIBUTION AND EXTENT: Central Oregon, southwestern Idaho, northwestern California, Nevada and Utah; MLRA 10, 23, 25, and 26. The series is extensive.

MLRA OFFICE RESPONSIBLE: Reno, Nevada

SERIES ESTABLISHED: Crook County (Prineville Area), Oregon, 1964.

REMARKS: Diagnostic horizons and other features:
Mollic epipedon- the zone from 0 to 18 inches (A, AB, Bt1 horizons)

Argillic horizon- the zone from 8 to 25 inches (Bt1, Bt2 horizons)

The particle-size control section averages about 65 percent rock fragments.

Soil moisture regime - aridic bordering on xeric

ADDITIONAL DATA: Characterization data on 1 profile (S55 Oreg. 7-7 and 1-7) reported in Riverside Soil Survey Laboratory report for soil sampled in Prinville Area, Crook and Jefferson Counties, Oregon, 1955. Organic carbon data believed not to be reliable. Too high in the lower B and C horizon.

National Cooperative Soil Survey
U.S.A.

LOCATION SIMAS OR
Established Series
Rev. ED/AON/TDT
08/2001
SIMAS SERIES

The Simas series consists of very deep, well drained soils that formed in loess and colluvium from tuffaceous sediments. Simas soils are on hills and have slopes of 0 to 80 percent. The mean annual precipitation is about 11 inches, and the mean annual temperature is about 47 degrees F.

TAXONOMIC CLASS: Fine, smectitic, mesic Vertic Palexerolls

TYPICAL PEDON: Simas very stony clay loam, rangeland. (Colors are for dry soil unless otherwise noted.)

A--0 to 5 inches; grayish brown (10YR 5/2) very stony clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium platy structure; slightly hard, friable, moderately sticky and moderately plastic; many very fine and fine roots; many very fine pores; 15 percent gravel, 10 percent cobbles, 10 percent stones; slightly alkaline (pH 7.8); abrupt smooth boundary. (4 to 12 inches thick)

2Bt--5 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate fine and medium prismatic structure parting to strong medium blocky; extremely hard, very firm, very sticky and very plastic; many very fine roots; few very fine pores; continuous faint clay films or pressure faces; about 2 percent gravel; moderately alkaline (pH 8.3); clear wavy boundary. (5 to 17 inches thick)

2Btk--14 to 21 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 3/4) moist; weak medium prismatic structure parting to strong medium blocky; extremely hard, very firm, very sticky and very plastic; common very fine roots; few very fine pores; continuous faint clay films or pressure faces; about 2 percent cobbles; strongly effervescent and common white lime spots; moderately alkaline (pH 8.4); clear wavy boundary. (3 to 9 inches thick)

2Bk1--21 to 27 inches; yellowish brown (10YR 5/4) gravelly clay, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; very hard, firm, moderately sticky and very plastic; few very

fine roots; many very fine pores; 20 percent gravel, 5 percent cobbles; many white lime spots; strongly effervescent throughout; strongly alkaline (pH 8.5); clear wavy boundary. (4 to 18 inches thick)

2Bk2--27 to 60 inches; light yellowish brown (10YR 6/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) moist; massive; very hard, firm, moderately sticky and very plastic; many very fine pores; 20 percent gravel, 15 percent cobbles, 5 percent stones; many white lime seams up to 1/4 inch wide; strongly effervescent; strongly alkaline (pH 8.5).

TYPE LOCATION: Grant County, Oregon; about 15 miles west of Mt. Vernon, Oregon; 1/3 mile up Marks Creek road from its junction with Hwy. 26; above road, 50 yards above the first sharp turn; SW1/4SW1/4 sec. 7, T. 13 S., R. 28 E. Latitude - 44 degrees, 27 minutes, 03 seconds North; Longitude - 119 degrees, 24 minutes, 18 seconds West. UTM 11 0308543 4924870

RANGE IN CHARACTERISTICS: The mean annual soil temperature is 47 to 54 degrees F. The soils are dry in all parts between depths of 4 and 12 inches for at least half the time (cumulative) during the period the soil temperature is above 41 degrees F, and dry between depths of 4 and 12 inches for more than 80 consecutive days during the summer; aridic soil moisture regime. Depth to a paralithic contact is 60 or more inches. Total rock fragments range from 0 to 35 percent in the particle-size control section. The mollic epipedon is 10 to 20 inches thick. Depth to soft powdery secondary lime is 10 to 30 inches.

The A horizon has value of 2 or 3 moist, 4 or 5 dry, and chroma of 1 or 2. It is loam, clay loam, silt loam, or silty clay loam, with 20 to 40 percent clay, 0 to 20 percent stones, 0 to 30 percent cobbles and 0 to 20 percent gravel. It is neutral or slightly alkaline.

The 2Bt horizon has value of 3 through 6 dry, 2 to 4 moist and chroma of 2 to 4 moist and dry. The 2Btk horizon has value of 3 or 4 moist, 4 through 6 dry and chroma of 3 or 4 moist and dry. It is clay, gravelly clay or cobbly clay. It has 50 to 60 percent clay, 0 to 30 percent cobbles and 0 to 25 percent gravel. It is slightly or moderately alkaline. The 2Btk horizon is slightly to strongly effervescent.

The 2Bk horizon has value of 3 to 5 moist, 5 to 7 dry and chroma of 3 or 4 moist and dry. It is clay loam or clay with 35 to 50 percent clay, 15 to 50 percent rock fragments, dominantly gravel and cobbles. It is moderately or strongly alkaline.

COMPETING SERIES: These are the Pung and Shadoval series. Pung soils have weak silica cementation below the argillic horizon. Shadoval soils are moderately deep to a paralithic contact.

GEOGRAPHIC SETTING: Simas soils are on hills at elevations of 1,200 to 4,000 feet. At higher elevations, they are only on south-facing slopes. Slopes range from 0 to 80 percent. These soils formed in loess and colluvium in the upper part and old unconsolidated moderately fine and fine textured tuffaceous sediments in the lower part. The climate is semiarid continental with a mean annual precipitation of 9 to 12 inches but can range to 14 inches when on south-facing slopes. The mean summer temperature is 60 to 66 degrees F. The mean winter temperature is 31 to 36 degrees F. The mean annual temperature ranges from 45 to 52 degrees F. The frost-free period is 90 to 160 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Day, Court, Lithgow, Ruckles, Searles, Tub and Willowdale soils. Day soils lack an argillic horizon. Lithgow soils have an ochric epipedon and have more

than 35 percent rock fragments in the control section. Ruckles soils are clayey-skeletal have a lithic contact at 10 to 20 inches and are associated with basalt rimrock. Searles soils have a medium or moderately fine textured control section. Tub soils have a mollic epipedon over 20 inches thick. Willowdale soils are on flood plains and are medium textured.

DRAINAGE AND PERMEABILITY: Well drained; slow permeability.

USE AND VEGETATION: The principal use is for livestock grazing. Native plants are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and Wyoming and basin big sagebrush.

DISTRIBUTION AND EXTENT: Central and east-central Oregon; MLRA 10. The series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Grant County, Oregon, 1970.

REMARKS: Diagnostic horizons and other features:
Mollic epipedon- the zone from 0 to 14 inches (A and 2Bt horizons.)
Argillic horizon- the zone from 5 to 21 inches (2Bt and 2Btk horizons)
Pale feature- clay increase of 15 percent (absolute) between the A and 2Bt horizons.
Aridic soil moisture regime.
Soft powdery secondary lime at 14 to 60 inches (2Btk, 2Bk1 and 2Bk2 horizons)

ADDITIONAL DATA: Characterization data for one profile (570-Oreg-23-1) by Oregon State University Laboratory (not published).

National Cooperative Soil Survey
U.S.A.

LOCATION TUB OR
Established Series
Rev. GLG/AON/TDT
10/2001

TUB SERIES

The Tub series consists of deep and very deep, well drained soils that formed in old sediments of volcanic origin. Tub soils are on hilly uplands and have slopes of 1 to 70 percent. The mean annual precipitation is about 12 inches and mean annual temperature is about 46 degrees F.

TAXONOMIC CLASS: Fine, smectitic, mesic Vertic Argixerolls

TYPICAL PEDON: Tub gravelly clay loam, cultivated. (Colors are for moist soil unless otherwise noted.)

Ap--0 to 6 inches; black (10YR 2/1) gravelly clay loam, gray (10YR 5/1) dry; weak fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots; many fine irregular pores; 20 percent gravel; neutral (pH 7.2); abrupt smooth boundary. (6 to 14 inches thick)

Bt1--6 to 12 inches; black (10YR 2/1) gravelly clay loam, gray (10YR 5/1) dry; weak medium prismatic and moderate fine subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; nearly continuous faint clay films on peds and in pores; 15 percent gravel; neutral (pH 7.2); clear smooth boundary. (0 to 7 inches thick)

Bt2--12 to 20 inches; dark brown (10YR 3/3) gravelly clay, brown (10YR 5/3) dry; weak medium prismatic and moderate medium subangular blocky structure; very hard, firm, sticky and very plastic; common very fine roots; many very fine tubular pores; 15 percent gravel; continuous faint very dark brown (10YR 2/2) clay films on peds and in pores; slightly alkaline (pH 7.6); clear wavy boundary. (6 to 9 inches thick)

Bt3--20 to 29 inches; dark brown (10YR 3/3) gravelly silty clay, brown (10YR 5/3) dry; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine roots; many very fine tubular pores; continuous faint clay films on peds and in pores; 20 percent gravel; moderately calcareous; slightly alkaline (pH 7.6); clear wavy boundary. (6 to 12 inches thick)

Btk--29 to 37 inches; dark yellowish brown (10YR 4/4) gravelly clay loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; 20 percent gravel and 10 percent cobbles; faint nearly continuous clay films on peds; light gray soft secondary lime; gravel and cobbles lime-coated; strongly calcareous; moderately alkaline (pH 8.4); abrupt wavy boundary. (0 to 10 inches thick)

2Bk--37 to 60 inches; light gray (10YR 7/2) cobbly loam, very pale brown (10YR 8/2) dry; massive; hard, firm, slightly sticky and slightly plastic; few very fine pores; 15 percent gravel and 15 percent cobbles; strongly calcareous; moderately alkaline (pH 8.4).

TYPE LOCATION: Wasco County, Oregon; 300 feet west of Tub Springs Road where road turns northwest from due east-west on section line between section 27 and 34, T. 8 S., R. 16 E.

RANGE IN CHARACTERISTICS: The soils are moist in some part above a depth of 12 inches for at least 1/2 the time (cumulative) during the period the soil temperature is above 41 degrees F. They are dry throughout between depths of 4 and 12 inches for 70 to 90 consecutive days in most years within the 4-month period following the summer solstice (xeric soil moisture regime). The mean annual soil temperature is 47 to 50 degrees F. The mollic epipedon is 20 to 25 inches thick. The solum is commonly gravelly or cobbly, ranging from 10 to 45 percent rock fragments. The particle-size control section averages 15 to 35 percent rock fragments. Cobbles range from 0 to 20 percent and gravel from 10 to 25 percent. The percentage of surface covered with stones is 0 to 15 percent. Depth to consolidated bedrock is 40 to over 60 inches. Depth to secondary lime 18 to 37 inches.

The A horizon has value of 4 or 5 dry, 2 or 3 moist and chroma of 1 or 2 moist and dry.

The Bt horizon has value of 3 or 4 moist, 4 or 5 dry, and chroma of 2 to 4 moist and dry. It has 40 to 60 percent clay. It has weak to moderate prismatic structure and moderate to strong subangular blocky to angular blocky structure.

The Bk and Btk horizons are loam, clay loam, silty clay loam, silty clay or clay. It has value of 3 to 7 moist, 5 to 8 dry, and chroma of 2 or 3 moist and dry. It has 0 to 40 percent rock fragments, mostly cobbles and gravel. It is firm or very firm. It is mildly or moderately alkaline.

COMPETING SERIES: There are the Ayette, Darow, Forsgren, Gimmi, Hann, Karney, McDesh, Kuck, Montour, and Ukiah series. Ayette soils are deep to a paralithic contact, are not pachic and lack carbonates. Darow, Gimmi, Karney, Kuck and Ukiah soils are moderately deep to a paralithic contact. McDesh soils are moderately deep to a lithic contact. Foresgren soils are not pachic and have secondary carbonates at 40 to 55 inches. Hann soils lack secondary carbonates. Moutour soils have stratified sandy and loamy materials below the argillic horizon and occur within 40 inches of the soil surface.

GEOGRAPHIC SETTING: Tub soils are on hilly uplands at elevations of 2,600 to 4,500 feet. Slope gradients range from 1 to 70 percent. The soil formed in fine textured old calcareous sediments of volcanic origin. The mean annual precipitation is 11 to 14 inches, the mean annual temperature is 45 to 50 degrees F., the mean summer temperature is 61 to 64 degrees F., and the mean winter temperature is 30 to 34 degrees F. The frost-free period is 90 to 130 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Curant, Day, Degner, Donnybrook, Ginser, Gribble, McMeen, Rail, Ridgeway, Schrier and Simas soils. Curant soils are on north-facing slopes and have a moderately fine textured cambic horizon. Day and Ridgeway soils are very fine textured, lack an argillic horizon and have intersecting slickensides. Degner soils have more than 35 percent rock fragments in the control section. Donnybrook soils are less than 20 inches deep to bedrock. Ginser soils are on north-facing slopes at higher elevations and have mean annual soil temperature of less than 47 degrees F., and have more than 35 percent rock fragments in the control section. McMeen soils have a duripan and are moderately fine textured. Rail soils lack an argillic horizon and are poorly drained. Schrier soils are fine-loamy and lack an argillic horizon. Simas soils have an aridic soil moisture regime and a mollic epipedon less than 20 inches thick.

DRAINAGE AND PERMEABILITY: Well drained; slow permeability.

USE AND VEGETATION: Tub soils are used for small grains and for livestock grazing. Native plants are bluebunch wheatgrass, Idaho fescue, Sandberg bluegrass, and related forbs.

DISTRIBUTION AND EXTENT: Central Oregon; MLRA 10. The series is extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Wasco County (Trout Creek-Shaniko Area), Oregon, 1970.

REMARKS: Diagnostic horizons and features recognized in this pedon are:

Mollic epipedon - the zone from 0 to 29 inches (Ap, Bt1, Bt2, and Bt3 horizons)

Argillic horizon - the zone from 12 to 29 inches (Bt2 and Bt3 horizons)

Calcic feature - soft powdery secondary lime at 29 inches (Btk horizon)

Particle-size control section - the zone from 12 to 29 inches; clay content is over 40 percent throughout

The Tub series was established in 1970. The Geoconda series was established in 1984 and updated in 1988, in neither description was the Tub series differentiated. The series are very similar except for the fact that the remarks paragraph in the Geoconda series states that a calcic horizon is present at 25 to 57 inches. These two series need further review.

Reclassification from Calcic Pachic to Vertic Argixerolls 4/96.

ADDITIONAL DATA: Characterization data on two profiles (S57-ORE-33-15 and S57-ORE-33-16) reported in Riverside Soil Survey Laboratory Report for soils sampled in Wasco, Sherman and Gilliam Counties in Oregon, May, 1959.

National Cooperative Soil Survey
U.S.A.

LOCATION WANOGA OR
Established Series
Rev. WMF/TDT
04/2000
WANOGA SERIES

The Wanoga series consists of moderately deep, well drained soils on volcanic uplands. They formed in ash and colluvium. Slopes are 0 to 50 percent. The mean annual precipitation is about 15 inches and the mean annual temperature is about 45 degrees F.

TAXONOMIC CLASS: Ashy, glassy, frigid Humic Vitrixerands

TYPICAL PEDON: Wanoga ashy sandy loam - woodland, on a 10 percent northwest-facing slope at 2900 feet elevation. (When described (7/22/86), the soil was dry throughout. Colors are for moist soil unless otherwise noted.)

Oi--0 to 1 inch; slightly decomposed needles and twigs of ponderosa pine.

A1--1 to 3 inches; very dark brown (10YR 2/2) ashy sandy loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; many fine irregular pores; 5 percent gravel; neutral (pH 6.8); gradual wavy boundary.

A2--3 to 13 inches; dark brown (10YR 3/3) ashy sandy loam, brown (10YR 4/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few very fine, fine and medium

roots; many very fine irregular pores; 5 percent gravel; neutral (pH 6.8); gradual wavy boundary. (Combined thickness of the A horizon is 10 to 15 inches).

Bw--13 to 25 inches; dark brown (10YR 3/3) ashy sandy loam, brown (10YR 5/3) dry; weak fine and medium subangular blocky; slightly hard, friable, nonsticky and nonplastic; few very fine, fine, medium, and coarse roots; many very fine irregular and few fine tubular pores; 10 percent gravel; neutral (pH 7.0); clear wavy boundary. (9 to 25 inches thick).

2Crqt--25 to 35 inches; weathered tuff; silica coatings and clay coatings are present in the vesicles of the rock.

2R--35 inches; tuff.

TYPE LOCATION: Deschutes County, Oregon, 500 feet east and 500 feet south of the northwest corner of section 19, T. 14 S., R. 11 E. (Latitude 44 degrees, 21 minutes, 15 seconds N, Longitude 121 degrees, 28 minutes, 12 seconds W)

RANGE IN CHARACTERISTICS: These soils are usually moist and are dry in all parts of the soil moisture control section for 90 to 110 consecutive days after the summer solstice. The mean annual soil temperature is 44 to 47 degrees F. Depth to bedrock is 20 to 40 inches. The solum contains 50 to 80 percent volcanic glass and glass-coated aggregates. Soil reaction is neutral throughout. Phosphate retention is 40 to 70 percent. The acid oxalate extractable aluminum plus one-half the acid oxalate extractable iron is 0.40 to 1.0 percent. The 15-bar water content on dried and undried samples is 5 to 12 percent. Field estimated clay content is 5 to 15 percent. The mollic epipedon is 10 to 15 inches thick. Base saturation is 80 to 100 percent by ammonium acetate.

The A horizon has hue of 10YR, value of 2 or 3 moist, 4 or 5 dry and chroma of 2 or 3 moist and dry. It contains 0 to 30 percent gravel. It is ashy sandy loam or ashy loamy sand.

The Bw horizon has hue of 10YR, value of 3 or 4 moist and 5 or 6 dry and chroma of 2 or 3 moist and dry. It is ashy sandy loam, ashy fine sandy loam or cobbly ashy sandy loam. It contains 0 to 10 percent durinodes and 0 to 25 percent concretions that are very friable when moist. It contains 0 to 15 percent gravel and 0 to 30 percent cobbles. Total coarse fragments range from 10 to 30 percent.

The 2Crqt horizon, when present, contains silica and clay coatings. It may have a discontinuous silica cap at the upper boundary.

COMPETING SERIES: These are the Ermabell, Laidlaw, Lundgren, and Suttle series. All of these soils are over 40 inches deep to bedrock.

GEOGRAPHIC SETTING: Wanoga soils are on volcanic uplands and plateaus. Elevations are 2800 to 4800 feet. Slopes are 0 to 50 percent. They formed in ash over bedrock. The climate is characterized by cold, wet winters and hot, dry summers. The mean annual precipitation is 12 to 18 inches. The mean annual temperature is 42 to 47 degrees F. The frost-free period is 20 to 90 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Fremkle, Fryrear, Henkle, and the competing Laidlaw soils. The Fremkle and Henkle soils are 10 to 20 inches to bedrock. Fryrear soils are ashy-skeletal.

DRAINAGE AND PERMEABILITY: Well drained; moderately rapid permeability.

USE AND VEGETATION: These soils are used for livestock grazing, timber production, wildlife habitat, and recreation. Potential native vegetation is ponderosa pine, western juniper, antelope bitterbrush, mountain bigsagebrush, and Idaho fescue.

DISTRIBUTION AND EXTENT: Footslopes and plateaus of the eastern Cascades of central Oregon; MLRA 6. The series is moderately extensive.

MLRA OFFICE RESPONSIBLE: Portland, Oregon

SERIES ESTABLISHED: Deschutes County (Upper Deschutes River Area), Oregon, 1992.

REMARKS: Diagnostic horizons and other features in this pedon are:

mollic epipedon: from 1 to 13 inches (A1, A2 horizons). Base saturation is 84 to 99 percent (NH40AC) for all horizons.

cambic horizon: from 13 to 25 inches (Bw horizon). This horizon has mollic colors but lacks the organic matter content to qualify as mollic.

andic soil properties: P-retention is 60 percent for all horizons. The amount of glass and glass-coated aggregate in the very fine sand fraction is 70 percent for all horizons. The acid oxalate extractable aluminum plus one-half the acid oxalate extractable iron is 0.45 percent in the A horizons and 0.35 in the Bw horizon.

Vitri (great group): The 15-bar water content on both dried and undried samples is 9.0 for all horizons.

The ash deposit is from Mt. Mazama.

ADDITIONAL DATA: Laboratory data from type location S860R-017-001.

National Cooperative Soil Survey
U.S.A.

Appendix W Western Juniper Report

WESTERN JUNIPER REPORT

PROJECT: Crooked River National Grassland Vegetation Management/Grazing EIS

Date: July, 2004

WESTERN JUNIPER (Juniperus occidentalis)

EXISTING CONDITION

Western juniper woodlands occur across a broad variety of physiographic landforms, soil types, elevations and moisture regimes. The area occupied by western juniper woodlands in the Pacific Northwest is nearly 4 million acres (Eddleman et.al. 1994). Over 2.3 million acres of juniper woodlands are in Oregon with approximately 10% of the area in old woodlands (Eddleman et. al., 1994). Nearly 90% of the area in Oregon is composed of young woodlands with trees less than 150 years old (Eddleman et.al. 1994). Data and observation indicate the species continues to expand its range into new areas (Eddleman et.al. 1994). Estimates provided from various sources including the Bureau of Land management, county Extension Offices and ASCS Offices indicate that less than 4,000 acres per year of western juniper woodland in Oregon have been treated to reduce western juniper density over the last 10 year period. Wildfire is not included in these estimates. Conversely, age class-area data indicates a general rate of woodland expansion of about 18,000 acres per year in Oregon over the last three reported decades. However, expansion rates of stands roughly 30 years old or less were not reported (USDA/USDI 2000). Since the turn of the century, western juniper has been actively expanding its distribution and density in central and eastern Oregon. Its present distribution may be as much as double that which was present in the late 1800's (Eddleman 1986). A study of paired disturbed and undistured plots (some of the data was generated from the Grassland) indicated that traditionally cited disturbance mechanisms can accelerate establishment rate of western juniper, expecially with domestic livestock grazing on sites that are downslope from established woodlands. However, establishment rates are generally accelerated regardless of the active disturbance regime, suggesting some other driving mechanism has either appeared, or become more dominant. In the absence of significant climatic changes or other major changes in the disturbance regime (e.g., an increasing frequency of major fires), establishment rates will continue to increase during the 21st century as the large group of trees establishing in the post 1940s period become fully reproductive (Soule et. al. 2004) Table 3-4 Existing Condition, HRV and Difference by Seal/Structural Stage for CRNG displays relative amounts of existing and historical, western juniper (*Juniperus occidentalis*) and big sagebrush (*Artemisia tridentata*) plant community types (by Viable Model seral status category).

All big sagebrush plant community types within the planning area would progress to a western juniper climax under a climatic (without fire) regime. However, under edaphic conditions (with a fire regime approximating that of the historic range of variability (HRV)) the majority of the area currently classified as western juniper plant community type, would be reverted to big sagebrush plant community types. This is evidenced by the limited presence of "old" (>200 years) western juniper trees present within most of these stands, with the vast majority of trees apparently less than

approximately 120 years old. Unlike many other tree species, the age of western juniper does not have sound correlation with diameter, or tree height, instead, "old growth" juniper is most soundly expressed by growth form. That is, while younger, actively growing western juniper trees may have greater diameters or heights, their growth form may be described as pointed topped. On the other hand, "old growth" juniper typically occurs on very rocky, harsh sites where their diameters and height are limited, but their growth form may be described as flat topped (Miller, R.M. 1995), or spherical (Agee 1993). Current and past management has resulted in an active "invasion" of western juniper into big sagebrush plant community types within the Crooked River National Grassland. Densities of western juniper trees are currently impacting understory species composition and richness on many of these invaded big sagebrush sites. This is actually consistent with western junipers expansion of range and increase in densities regionally over the last century (Miller and Wigand 1994)(Miller and Rose 1995)(Eddleman and Miller 1991) (Miller, Eddleman and Miller 1992)(ICBEMP 1997). In fact, regionally the abundance of western juniper pollen appears to be greater during this century than during the past 5000 years (Miller and Wigand 1994).

Establishment of western juniper is also becoming a considerable concern within both aspen and riparian community types within the planning area as well as regionally (ICBEMP, 1997). Current western juniper densities within these plant community types appear to be having limited impacts to understory vegetation at this time.

Western juniper is a highly competitive plant whose primary limitations include susceptibility to fire (Agee 1993) (Miller and Wigand 1994) and hard frosts occurring in the spring (Eddleman 1995). Mortality due to age (Miller and Wigand 1994), disease, and insect predation is negligible and would not be expected to have any noticeable impact on western juniper populations (Lanner 1984). Western juniper is much more resistant to drought than most plant species, giving it a distinctive competitive advantage in the absence of fire (Meeuwig 1979). Pre-european settlement, western juniper was limited in the expression of its range by periodic fire. This left western juniper occurring, for the most part, on very harsh, often rocky and/or shallow soils where insufficient fuels could be produced to carry fire (Agee 1993)(Miller and Wigand 1994)(Miller and Rose 1995). Western juniper is very susceptible to fire in its sapling stage (less than 6 ft. in height). Because of its slow rate of early growth it generally requires 40 to 50 years to reach sufficient size to become fire resistant (Agee 1993)(Miller and Wigand 1994). Western juniper also does not reach reproductive maturity until approximately 50 to 60 years of age (Miller and Wigand 1994)(Miller and Rose 1995). At this point the rate of western juniper regeneration shifts from a linear to a geometric increase (Miller and Rose 1995)(Miller and Wigand 1994). Western juniper seed is primarily dispersed by bird and coyote defecation, and water (Miller and Wigand 1994). It is apparent that western juniper seed germination and successful early establishment is greatly enhanced by the presence of a "nurse plant" (most often a sagebrush or bunchgrass plant) to provide more favorable microsite conditions (Agee 1993)(Miller and Rose 1995). Western juniper has two distinct phases of development during which it employs different growth strategies. As a juvenile, when western juniper has needle like leaves, growth strategy is to maximize photoproduction and allocate energy for growth primarily to the roots. The relative cost is some sensitivity to soil moisture conditions. As an adult priority of production is still attributed to the roots first, however, leaves alter to become more scale like and overlapping, allowing for maximization of resistance to soil moisture sensitivity (Miller, P.M. 1995).

Given the above information one can see that in a system: which is prone to periodic drought, where other dominant species present are expected to experience population affecting mortality associated with disease and depredation, and where fire has predominantly been removed as a disturbance factor for the past 50 to 100 years; that juniper would increase into those areas which had previously carried fire. In such an instance, western juniper would be expected to slowly increase into areas immediately adjacent to the harsh sites it had been limited to (rim-rock, scab flats, etc.) prior to removal of fire from the system, as birds and coyotes fed on the berries and moved off the site. There would be the same slow increase in western juniper in water courses down stream from source populations, but extended a greater distance from those sources. In fact, the Interior Columbia Basin Ecosystem Management Project: Eastside Draft Environmental Impact Statement (ICBEMP, 1997) indicates that there has been extensive western juniper establishment within riparian areas regionally. This slow increase would continue for the first 50 to 60 years following the last fire to burn in the area. However, around this time period all of the new young western juniper trees would be reaching reproductive maturity, and would begin to produce large amounts of seed. The rate of increase would then become very rapid within this "new" western juniper plant community and a slow increase in juniper adjacent to this area would begin. While resource (water, soil, nutrients, etc.) limitations within the original source sites (harsh sites) kept western juniper densities to approximately 5 tree/ha, the new invaded sites have much greater amounts of available resources. Thus, as the competitively superior species (again in the absence of fire) western juniper tree densities increase. Adult western juniper density ranges from 35 to 450 trees/ha have been measured on invaded big sagebrush sites (previously sparse on these sites), and from 725 to 2000 adult trees/ha on invaded aspen sites (previously absent on these sites) (Miller and Rose 1995). The plant community types within the interior Columbia Basin currently displaying the greatest encroachment of western juniper include: mountain big sagebrush, aspen, cottonwood, and willow (ICBEMP, 1997).

Precipitation falling on juniper is partially intercepted by the foliage, branches and trunk. Most is evaporated back into the atmosphere and does not reach the ground. Interception loss in mature (80 – 100 yr old) woodlands is largely dependent on canopy cover. Research in south central Oregon suggests that a canopy cover of 20% results in a loss of effective moisture equivalent to approximately two inches per year and that of a 35% canopy cover represents an approximate three inch per year loss of effective moisture . Interception losses would be expected to increase where the proportion of precipitation received from storms of less than 0.5 inches also increases. If precipitation is largely wet snow without wind, intercepted amounts can be much higher (Bedell et.al. 1993).

Juniper has an extensive lateral root system and a deep taproot allowing it to compete vigorously with other vegetation for available moisture. As western juniper increases on these "new" sites it: reduces effective moisture on the site (Miller and Wigand 1994) and may influence subsurface water flow (Eddleman and Miller 1991)(Miller and Wigand 1994), concentrates soil nutrients (Miller and Wigand 1994)(Doescher, Eddleman and Vaitkus 1987), and increases surface runoff and consequently soil movement off site (Miller and Wigand 1994). Western junipers' ability to; utilize October through April moisture (Bedell et.al. 1993), intercept moisture within it's foliage (which is then evaporated or in the case of snow sublimated), and access deep moisture via its' deep tap root; has the potential to reduce effective site moisture by 50 percent (Eddleman and Miller 1991). In fact, on sites with a shallow rocky soil profile, one would expect western juniper to utilize all water prior to it percolating below the soil profile (Eddleman and Miller 1991). In deeper soils, one would

expect deep percolated storage to be depleted by western juniper. Western juniper has the abiltiy to transpire very large amounts of water. In April, use may reach 20 gallons per day per tree (Bedell et.al. 1993). With high soil moisture levels a single tree with a butt diameter of 18 inches may transpire up to 30-40 gallons per day (Bedell et.al. 1993). In addition, western juniper may be able to tap subsurface flows, thus directly effecting site hydrology (Eddleman and Miller 1991). On most sites, as western juniper increases, understory vegetation decreases (Miller and Wigand 1994) (Gedney et.al. 1999). This in turn leads to decreased infiltration, and increased erosion associated with surface runoff. Sediment yields measured for different ecoclass types showed that: meadows yielded approximately 100 kg/ha, mountain grasslands yielded approximately 400 kg/ha, mountain big sagebrush types yielded approximately 900 kg/ha, and western juniper invaded sites yielded approximately 1500 kg/ha (Eddleman and Miller 1995). Long term erosion resulting in total or partial loss of the A soil horizon is one way in which western juniper encroachment reduces site productivity (Miller and Wigand 1994). In addition, erosion associated with increased juniper, and direct impacts on riparian vegetation would be expected to have an adverse impact on water quality and fisheries habitat (Eddleman and Miller 1995). Long term dominance of western juniper on an invaded site also results in an alteration in energy and nutrient spacial distribution, with juniper concentrating "islands" of nutrient and biomass richness under and within individual tree canopies and rooting zones, amidst an "ocean" of nutrient and biomass deficient interspaces (Doescher, Eddleman and Vaitkus 1987)(Miller and Wigand 1994). This in turn is expected to drastically influence soil chemistry (Doescher, Eddleman and Vaitkus 1987). These influences profoundly effect the other plant species occurring on the site. The loss of species diversity within the system due to the dominance of western juniper (Miller and Wigand 1994) is another way in which the invasion of this species impacts site productivity potential. As stated earlier, on most sites, as western juniper increases, understory vegetation decreases. Shrubs and deeper rooted forbs appear to be particularly sensitive to western juniper competition and decline first and most notably (Eddleman 1995). Apparently due to the reduction in perennial vegetation, cheat grass (*Bromus tectorum*) has been shown to increase as western juniper increases on a site (Vaitkus and Eddleman 1991). However, removal of western juniper has also been shown to increase cheat grass and medusa head (*Taeniantherum asperum*). The potential of these undesirable species forming a closed community is dependent upon the composition of the understory prior to western juniper removal (Miller and Wigand 1994). With dominance of western juniper, on some sites the understory becomes extremely depauperate with as much as 70 percent bare ground in the interspaces between trees (Miller and Wigand 1994). Bare ground greatly increases soil surface and subsurface temperatures (Buckhouse 1995). Altered soil; chemistry, nutrient distribution, and surface/subsurface temperatures, would be expected to influence mycorrhizal and bacterial function within the system (Eddleman and Miller 1995), further impacting previously existing plant species.

Figure 3-4. (Tausch et.al. 1981) displays the relationship between understory cover and juniper cover closure.

Figure 3-1 Effects of Juniper Canopy Closure on Understory Cover

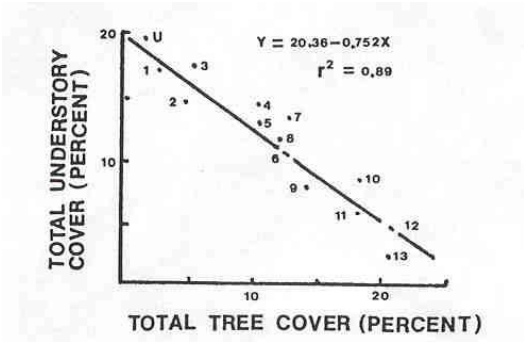


Figure 1.--Decline in understory cover as tree cover increases (Tausch and others 1981).

Although western juniper most commonly invades mountain big sagebrush, aspen and riparian community types, it is becoming apparent that western juniper is also increasing upslope within the dryer conifer types as well (Miller and Wigand 1994). Just as periodic fire is necessary to maintain big sagebrush, aspen, and arid riparian community types, a relatively frequent fire return interval is necessary to maintain ponderosa pine community types (ICBEMP, 1997). Although very little research has been conducted concerning the effects of juniper encroachment into ponderosa pine community types, with western junipers'; inefficiency in water usage (Miller, Eddleman and Miller 1992), influence on effective site moisture (Eddleman and Miller 1991), and ability to withstand stress (Miller, P.M. 1995), one would expect that western juniper could negatively impact ponderosa pine in a manner similar to other plants, especially if the pine is already stressed by drought, disease, and/or insect depredation.

DESIRED FUTURE CONDITION

Although the Land and Resource Management Plan for the Crooked River National Grassland (LRMP) is vague in specific reference to management of western juniper, or even invasive plant species which are not categorized as noxious weeds, it does contain general references and standards concerning management of: forage and livestock, soils, diversity, riparian, wildlife, and scenic resources which are applicable.

TREATMENT

Failure to treat juniper invaded sites will eventually result in detrimental soil impacts. As these detrimental soil impacts proceed, site productivity will be reduced. At the point where site productivity is reduced beyond which a simple disturbance (such as a fire) will not revert the site back to a pre-invasion potential, a threshold is reached where an irreversible or irretrievable commitment of resources has been made (through inaction) for that site. Once beyond this threshold an inordinate amount of input (in the form of energy and component costs) is required to bring the site back to its previous potential (Bunting 1995). Within the Crooked River National Grassland,

that threshold has been reached in some areas and is being rapidly approached in other areas. Currently the greatest risk of surpassing this ecological threshold is occurring on invaded big sagebrush and ponderosa pine plant community types. Due to the much greater productivity protential, invaded aspen and riparian plant community types would not be expected to reach this threshold until later.

Harvest treatments are recommended in situations where western juniper is increasing and has begun to reduce understory vegetation, and where tree size exceeds that readily treated by fire. Within the Crooked River National Grassland that would include much of the invaded big sagebrush plant community types and much of the big sagebrush/bitter brush/ponderosa pine ecotones. In such treatments, it is recommended that western juniper foliage be left on site in a lop and scatter type treatment. This has been shown to reduce site recovery time by approximately one half (Eddleman and Miller 1995). It is also recommended that large, "old growth" form western juniper trees be left in place. Reintroduction of fire into the system is recommended to be delayed from 7 to 15 years post harvest, as this has produced a second pulse of available moisture within treated systems (Eddleman and Miller 1995). In treated systems which have required seeding, broadcast seeding prior to harvest treatment has resulted in better seedling establishment than post harvest broadcast seeding (Eddleman and Miller 1995). When adequate remnant understory species exist post harvest grazing may only require one year of rest followed by one year of deferment for satisfactory recovery (Eddleman and Miller 1995).

Within aspen and riparian plant community types into which western juniper is encroaching, all western juniper trees should be treated, as western juniper was historically absent from these community types (Miller and Rose 1995). Few of the sites within the Crooked River National Grassland retain an understory component that would respond well to prescribed fire (the most economical treatment option). Use of juniper as rip-rap, or as a large wood component within riparian systems has been effective in recovery efforts elsewhere (Buckhouse 1995).

Where western juniper is encroaching into the ponderosa pine community types it appears that the majority of the existing western juniper on these sites are from 60 to 80 years of age and, for the most part, are not very susceptible to broadcast fire at their current stage. Felling is recommended, and if necessitated by fuel loadings, post treatment broadcast burning can be conducted.

With prescribed fire or other soil disturbances associated with juniper treatment, care must be taken to ensure that these treatments do not contribute to the spread and/or establishment of noxious weeds.

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Appendix X Response to Public Comment

Public Comments and Agency Responses

Introduction

The purpose of this appendix is to display the substantive comments to the draft Crooked River National Grassland Vegetation Management/Grazing Environmental Impact Statement (DEIS), and to show the corresponding Forest Service responses. Included in this appendix are:

- background information on how comments were obtained;
- information about those who commented and how comments were used;
- list of those who commented;
- comments and responses; and
- copies of governmental and tribal letters received.

Background Information on How Comments Were Obtained

The Notice of Availability for the DEIS was published in the Federal Register on April 9, 2004 (Vol. 69, No. 69, ER-FRL-6650-1, EIS No. 040151). Public Notices briefly describing the analysis were published in two local newspapers. A news release was submitted to the local media informing people of:

- the time and location of the April 17, 2004 Open House,
- the desire for comments, a summary of the proposed actions,
- the contact address,
- a brief history of the Grassland, and
- the location of the DEIS on the internet.

The Forest Service is required to send a complete copy of any DEIS to various federal and state agencies. The DEIS was sent to 31 representatives of state and federal agencies and nine tribal representatives. A list of interested persons and organizations requesting a copy of the DEIS was compiled throughout the analysis process. A copy of the DEIS was sent to 152 interested parties. The DEIS was distributed in both hardcopy and electronic format. The DEIS was also available for review on the World Wide Web.

Following the release of the DEIS, meetings were conducted with the Gray Butte Grazing Association, and an Open House meeting was conducted on April 17, 2004 to present the DEIS to the public. Nine people including Grassland personnel attended the meeting. The Open House meeting provided the public an opportunity to submit comments and obtain a copy of the DEIS if they desired one.

During the 45 day comment period, comments were provided by 24 individuals and organizations from: the Open House, telephone contacts, and letters. All substantive comments were considered. Comments considered and responses are recorded in within this appendix to the Final Environmental Impact Statement (FEIS). Public comment led to the need for supplemental documentation of existing analysis which is the basis for the differences between the DEIS and the FEIS. Changes between the FEIS and DEIS are explained within the responses to comments generating those changes.

Information About Commenters and How Comments Were Used

In accordance with CEQ (40 CFR 1503.4), Response to Comments, we have assessed comments collectively and individually and have responded by a variety of means including:

- Modify alternatives, including the proposed action.
- Develop and evaluate alternatives not previously given serious consideration.
- Supplement, improve, or modify the analysis.

- Make factual corrections.
- Explain why the comments do not warrant further agency response, citing the sources, authorities or reasons that support the agency's position and, if appropriate, indicate those circumstances that would trigger agency reappraisal or further response.

As expected with any solicitation of comments on particular proposed activities, many are similar. We have, therefore, chosen to respond to what we believe to be representative comments. Some reviewers may not find their exact comment. In some cases similar comments may be combined and a single response made. We believe all substantive comments that were pertinent to the DEIS and received during the comment period have been addressed. The reviewer may feel that some comments are not substantive and should not have been included. Comments have been grouped by topic areas and were coded so that the origin of the comment was retained as a reference.

Lists of Those Who Commented

Letters received from other governmental agencies, and public officials are reprinted at the back of this appendix. We have elected to include some representative nonsubstantive comments to show the variety of viewpoints held by reviewers, especially when several people expressed similar thoughts. The following is a list of all those who commented on the DEIS.

Central Oregon Chapter of the Native Plant Society of Oregon
League of Wilderness Defenders - Blue Mountains Biodiversity Project and
Oregon Natural Desert Association
United States Department of the Interior (U.S. Fish and Wildlife Service)
Oregon Department of Fish and Wildlife
United States Environmental Protection Agency
Gray Butte Grazing Association
Society for Range Management, Central Oregon Chapter
Oregon Natural Resources Council
LeRoy Fessler
Oregon Natural Resources Council
Donald R. Shank
Gene Hickman
Max Johnson
The Confederated Tribes of the Warm Springs Reservation of Oregon
Earl Mitchell
Tom Kasch
Marilyn Kasch
Henry Melhorn

Comments and Responses

CULTURAL PLANTS

Comment

"Root grounds, if discovered, should be left intact."

Response

Although seeding is not proposed in primary habitats for plant species bearing culturally important roots (FEIS, Chapter 3, Section 3.11.2), the project design criteria include a clause requiring avoidance of viable cultural plant populations encountered during vegetation management project planning, layout, or implementation (FEIS, Chapter 2, Section 2.5.1). The same section requires that 20 percent of the 8,100 acres of cultural plant high priority habitat within old soil stabilization seedings, and proposed for either re-seeding or prescribed fire treatment to be surveyed prior to project implementation.

ECOLOGICAL INTEGRITY

Comment

"The area's rare native plants need to be restored, and this is just not feasible so long as livestock continue to damage the CRNG's soils, riparian zones, and fundamental hydrology--compounding the already extensive livestock devastation to the ecological balance of the plant communities."

"We suggest that management protocols be designed to prevent further deterioration of areas on the Grasslands that are in decent ecological shape. We are thinking here of spots such as Pine Ridge. This area is in better ecological shape, especially higher on the Ridge. The fence on the southwest side is being used to force cattle higher on the ridge and we are starting to see higher utilization, concentration, and weedy invasion in some areas. We strongly request that this be remedied and prevented in other similar areas."

Response

Both long term Condition/Trend Clustered transect evaluations as well as the data collected during the 2001 Range Ecological Site Condition and Trend Survey indicate that ecological trends are either static or upward under current management (including current grazing) on most of the Grassland (FEIS, Chapter 3, Section 3.3.2).

The FEIS incorporates the following grazing protocols to prevent ecological degradation:

- Delay turn-on pending meeting range readiness criteria.
- Length of livestock occupancy is limited by utilization as indicated by stubble height standards.
- Implementation of deferred rotation and periodic rest.

(Chapter 2, Section 2.4)

ECONOMICS

Comment

"The EIS has however failed to include an economically and scientifically accurate, reasonably unbiased, detailed discussion of why any social and/or economic need to continue grazing over the majority of the Grassland outweighs the ecological and economic benefits of healthy native vegetative communities."

Response

Controlling legislation (FEIS, Chapter 1, Section 1.3), including the Bankhead-Jones Farm Tenant Act of 1937, recognize domestic livestock use as a legitimate use of National Grasslands. The Purpose and Need section identifies the following needs: social and economic, more deep-rooted native grass species, less juniper (density and distribution), and eliminating grazing on three allotments. Grazing practices in Alternatives C and D were developed in part to accelerate the recovery of ecological conditions where conditions are improving under existing management or where ecological trends are static. The potential for livestock to cause a downward ecological trend was recognized and identified as a significant issue. Alternative D was developed, in part, to address this issue. The Design Criteria for Alternatives C and D were also developed to ensure that livestock use would not result in any ecological damage. The FEIS, Chapter 3, Ecological Trends section describes ecological trends and the relationship with livestock use. Where relevant, the environmental effects discussions for other resources (e.g. soils, water, etc.) disclose the effects of livestock use on that resource.

Comment

"Did the Gray Butte Grazing Association have any part in the degradation of the areas being closed? Do they pay grazing fees per Animal Unit Month that are equivalent of non-government fees on nearby private land, or would we still be subsidizing their operations?"

Response

The Purpose and Need section in Chapter 1 and the Ecological Trends section in Chapter 3 disclose the reasoning for closing these allotments. The Peninsula Allotment is the only allotment of the three where downward ecological trends due to livestock grazing were identified as one of the reasons for closure. Grazing fees for National Forests and Grasslands in the sixteen western states are calculated in accordance with the Executive Order issued February 14, 1986 (E.O. 12548) and the current rate is $1.43 per animal month.

EDITS

Comment

"Page 60, Table 3-5, Alternative C: E1s acres of proposed vegetation treatments do not add up to 16,940 as identified in the “After Treatment Summary”. The treatments should total 20,589 acres."

Response

Treatment summary tables are updated in the FEIS.

Comment

"Page 112, Second paragraph from the last: Third sentence should read "…22,118 acres (M2)…"

Response
The typographical error is corrected in the FEIS.

Comment

"Page 115, Table 3-27: Belding's Ground Squirrel existing acres should be 4,012."

Response
The typographical error in Table 3-27 is corrected in the FEIS.

Comment

"Page 117, Third paragraph: Second sentence should be edited to read, "The lack of grazing would in the short term not increase habitat acres, but habitat quality."

Response
The typographical error is corrected in the FEIS.

Comment

"Page 126, First paragraph, last sentence: It is unclear which species are being referred to in this sentence. This should be clarified in the FEIS."

Response
This sentence appears to be an error. It is corrected in the FEIS.

Comment

"Page 166, First paragraph: The last sentence…states, "Increased juniper treatments would increase understory more in Alternative C than D. Should this be decrease?"

Response
This statement is correct. It is expected that after juniper removal, understory grasses and shrubs will increase. This is clarified in the FEIS.

Comment

"Page 198, seventh paragraph: The Department believes that, based on the information provided in the DEIS, Alternative C is the best alternative for shrub-steppe restoration the greater sage grouse as it provides the greatest increase in habitat quantity by removing nearly twice as many acres of juniper as Alternative D."

Response

This typographical error is corrected in the FEIS.

PRESCRIBED FIRE

Comment

"Prescribed burning could be utilized instead of small dbh thinning of junipers as a more natural means of restoring native grasses where existing roads and locations allow for adequate fire control to avoid undesirable private property damage."

Response

Alternatives C and D both propose a suite of management tools, prescribed fire being one of them, to mange juniper. Weather prescribed fire alone is appropriate is dependent on local site conditions. Instances where the use of prescribed fire alone would not be ecologically appropriate are: when undesirable understory species would be favored by fire (FEIS, Chapter 3, Section 3.13.3), when retention of the understory shrub species is desired (FEIS, Chapter 3, Section 3.2.3), when fuel loadings would result in detrimental soil conditions when burned (FEIS, Chapter 3, Section 3.5.3), and when fuels loadings would result in unmanageable fire behavior during suppression efforts (FEIS, Chapter 3, Section 3.14.3).

Comment

"This topic is prescribed burning following juniper cutting, either where debris is broadcast and left scattered or where juniper is yarded/pushed into piles before burning. Burning too soon after falling trees may be detrimental to existing remnants of native perennial understory species. Any burning, even under very good conditions, is very hard on (usually fatal) to these species when found under or near the slash. When wood is treated before many years have past, allowing weather and climate to promote some break down in the slash, too much heat is generated for survival leaving death loss of individuals or islands of individuals. This is an invitation for dense weed (i.e. cheat) development. If mitigated by artificial seeding of natives, the adverse affects are of course reduced.

Piling does reduce the scattered impacts but creates even more severe impact areas and may not be desirable, unless this is obviously the best option. Holding the burning for at least 6-8 years, to as much as 10-15 years after cutting (better), may be preferred. By not being in a rush to burn, seedling perennials around debris have some grazing protection and begin more vigorous seed production due to the reduced competition for moisture. Also there are some wildlife ground cover habitat benefits that can accrue for several years. Delaying burning for as long as possible allows more slash deterioration with less perennial plant death loss, soil watershed cover loss, and less possible water repellency development in soils. Even with this delay, it will not be too late to kill developing juniper seedlings when the site is finally burned.

There is one factor we must consider about re-introducing fire to sites that have been protected from burning and missed several or many burning cycles. Even though fire was a natural influence

on these historic landscapes, the response at this point in time will not match that of burning in presettlement times and under historic conditions. Initially, stands can only be moved toward this goal and may need special treatment and multiple treatments to develop historic-like conditions and responses."

Response

While the DEIS indicates that slash will be burned two to three years following treatment the effects on post burn recovery of treatment units expressed within this comment are noteworthy. In fact, Eddleman and Miller (1995) indicate that delaying the reintroduction of fire into a system from seven to fifteen years post harvest has produced a second pulse of available moisture within treated systems. Therefore, in order to accrue the most desirable results a project design criterion is included within the FEIS (Chapter 2, Section 2.5), which calls for a seven-year delay of prescribed fire after initial juniper treatment if this meets fuels and seeding requirements.

Comment

"Page 167, second paragraph: Although fire will effectively and economically remove juniper, the Department is concerned that fire will further reduce limited sagebrush stands on the CRNG and mechanical removal may be more appropriate. The FEIS should discuss the consistency between restoration action objectives at the landscape level and the short- and long-term objectives of restoring the area to the historic range of variability."

Response

A project design criterion is added into the FEIS (Chapter 2, Section 2.5) limiting prescribed fire in sagebrush dominated stands until replacement stands have been restored through western juniper stocking control treatments.

GRASSLAND DESIGNATION

Comments

"The Grassland is a rare remnant ecological gem, located in the midst of urban sprawl, irrigated ploughed fields, and livestock pastures which surround it. Development and ranching have already claimed most of the once abundant grasslands ecosystem, and they now threaten encroachment on the scattered remnants of that ecosystem throughout Central Oregon. The National Grassland represents an ecological treasure which has been all but lost, and must be restored and protected as the natural ecological heritage of us all for generations yet to come."

"As the CRNG was congressionally withdrawn to represent the native grassland ecology for the public; it defies the intent of Congress to convert this irreplaceable area into public-subsidized cow pasture for a few private ranching operations. The DEIS proposals to further push the CRNG towards irretrievable use as private cow pastures, through tilling and seeding the area into livestock palatable monocultures, must be abandoned. The Grasslands should be protected as a commons for the benefit of native wildlife, native plants, and future generations of people, as similar ecosystems are being destroyed across central and eastern Oregon by urban sprawl, irrigation crops, and livestock pasturing."

Response

The FEIS, Chapter 1 Purpose and Need, General History of the Crooked River National Grassland, clearly indicates that, rather than being a remnant of a relatively undisturbed ecological system, the Grassland represents a federal buy back of repeatedly and intensively managed private lands.

Designation of the National Grasslands in 1960 did not result in a withdrawal of these lands as a commons or preserve. Title 36 of the Code of Federal Regulations, § 213.1, states that the National Grasslands "shall be administered under sound and progressive principles of land conservation and multiple use, and to promote development of grassland agriculture and sustained-yield management of the forage, fish and wildlife, timber, water and recreational resources in the areas of which the National Grasslands are a part."

GRAZING - FORAGE RESERVES

Comment

"The "Reserve Forage" should be left vacant, permanently closed to livestock grazing. This area also has tremendous scenic and recreational values with spectacular views of the Deschutes gorge."

Response

The establishment of "forage reserves" is included under Alternative C (FEIS, Chapter 2, Section 2.3). Under Alternative A all areas (including those proposed to be established as forage reserves under Alternative C) are closed to grazing. Under Alternative D the majority of the area proposed to be established as forage reserves under Alternative C is closed to grazing. The Canadian Bench portion of Alternative C's forage reserves not closed (under Alternative D) is placed in vacant status (FEIS, Chapter 2, Section 2.3). Approximately one quarter of the proposed forage reserves would remain open to grazing under Alternative D (Lower Desert Allotment). The effects of the alternatives relative to the recreation resource are disclosed within the FEIS, Chapter 3, Section 3.12.3.

Comment

"The FEIS should clarify how the forage reserve would be managed due to the large areas of private lands."

Response

The forage reserve management section (FEIS Chapter 2, Section 2.3.3) has been rewritten and should be easier to understand.

Comment

"The DEIS states that *"The portion of the Lower Desert Allotment proposed to be eliminated from grazing are (sic) located on private land that historically were included in the allotment. Today ownership has changed, grazing within the Grassland administered allotment is now questionable"* (DEIS Summary page 11). This leads ODFW to wonder if a forage reserve is even feasible."

Response

Alternative D was developed, in part, to address this concern identified through the original scoping process. Alternative D in the DEIS eliminated grazing on this portion of the Lower Desert Allotment..

GRAZING - GRAZING SYSTEMS

Comments

"[The Department recommends], (1) the elimination of re-entry within the Haystack allotment until vegetation conditions are restored."

"The Department also recommends the grazing strategy for the New Haystack Allotment be modified to exclude multiple entries."

"ODFW supports Alternative C … with the following modifications: … New Haystack Allotment - modify the grazing strategy (multiple entry) so that native forbs, grasses and shrubs can establish (i.e., rest rotation) and connectivity corridors can be created between the RNA and the rest of the grassland."

Response

The FEIS indicates in, Chapter 2, Alternatives Considered, that for Alternatives B, C, and D this system has been practiced successfully (i.e., stubble height standards are met). The range Condition and Trend sites as well as NCRS data indicate this Allotment (part of the Juniper Butte Allotment) is static or improving (FEIS Chapter 3, Section 3.3.2). The effects of this grazing system, where pertinent, are disclosed in the FEIS, Chapter 3 by resource area.

In addition, Title 36 of the Code of Federal Regulations, § 213.1, states that the National Grasslands "shall be administered under sound and progressive principles of land conservation and multiple use, and to promote development of grassland agriculture and sustained-yield management of the forage, fish and wildlife, timber, water and recreational resources in the areas of which the National Grasslands are a part". This allotment is the Grassland's only example of a high intensity, short-duration grazing system.

Comment

"…, we feel that the deferred rotation system with [the elimination of multiple pasture entries during a growing season] would be the best grazing system for the Grasslands. We see no reason to change to the proposed rest rotation system. Utilizing a rest rotation system there is greater risk of improper use. The NRCS rangeland evaluation of the grasslands shows that range trend is in an upward trend for most of the allotments. The change in grazing systems is not justified by the NRCS data, but will result in a loss of annual available forage. Depending on the number of pastures per allotment, this loss of forage will be 14 to 20 percent. With the imposed stubble height guidelines for pasture moves, this will impose an unnecessary and perhaps deleterious impact on permittees."

Response

The FEIS, Chapter 1, Section 1.4.2, indicates that, "[t]here is a need to leave a diversity of grass stubble heights (up to 15 inches or higher) at the end of the grazing season. On some of the historically homesteaded and farmed sites organic matter is lacking in and on the soil. Leaving sufficient stubble at the end of the grazing season will aid in the accumulation of organic matter which will aid in the establishment of deep-rooted native grass species. A range of stubble heights would provide habitat for ground nesting birds such as the California quail, western meadowlark, horned lark, and the burrowing owl. ... Discontinuing the re-graze option and establishing rest pastures where appropriate would result in a range of stubble heights of three to 15 inches or more, across each allotment at the end of the grazing season. This would, in turn, result in greater habitat diversity across the Grassland and help provide more favorable habitat conditions for a wide array

of wildlife species that depend upon taller grass stubble heights." The use of stubble height standards as a gauge to determine when grazing should cease on a pasture (which is also the gauge under a deferred rotation system) ameliorates any additional risk associated with a rest-rotation grazing system. The loss of forage associated with implementation of rest rotation systems is disclosed in the FEIS, Chapter 3, Forage Production/Livestock Use section. All comments received from the Gray Butte Grazing Association permittees support implementation of Alternatives C and/or D.

GRAZING - MISCELLANEOUS

Comment

"[The department is concerned that], additional allotment closures should be included."

Response

The effects of closure of all allotments are displayed under Alternative A (FEIS, Chapter 2, Section 2.3.1 and Chapter 3).

Comment

"An EIS should be prepared to discuss whether removing livestock, reintroducing fire, and removing roads would be as effective or more effective than juniper control in restoring hydrologic function, fire ecology, and vegetation composition."

Response

An alternative proposing the removal of livestock with vegetation treatments was considered but dropped from further consideration because it did not meet the purpose and need for the analysis, and it represented a combination of effects from Alternatives A, C, and D (FEIS, Chapter 2, Section 2.3).

Access and travel management falls outside of the purpose and need for this analysis (FEIS, Chapter 1, Section 1.4.2). This does not preclude the proposal and inclusion of access and travel management projects in future analyses.

GRAZING - IMPACTS

Comments

"Currently such conservation management has not been adopted, and signs of over-grazing by livestock are easy to discover during random spot-checking surveys of the CRG. Overgrazing damages includes:
a. greatly lowered water tables (4 to 5 feet down in the streambed by Monner Spring for instance),
b. heavy compaction of soils by livestock trampling (N. Boyce),
c. stripping of juniper bark by livestock rubbing,
d. bare ground with displaced soil from cattle wallows (N. Boyce),
e. areas of bare ground between encroaching sage brush ("Reserve forage," S. end near "Squaw" (sic) Creek,
f. short-cropped bunch grass with no seed-heads in late April and May (Rush & N. Boyce),
g. eliminated stream flow (N. Boyce, Monner, S. Schmoker), etc.
h. eroded streambanks (recently fenced-off Willow Creek by the Weanling allotment),

i. areas where riparian plants are scarce or absent (places along the streambed in S. Schmoker and Monner allotments, etc)."

"I could not disagree more with the position that overgrazing is not a problem. I think over-grazing is by far the worst problem on all federal lands including the grasslands."

Response

a) As the Fisheries and Hydrology Affected Environment FEIS, Chapter 3, Section 3.6.2 indicates, historic activities including homesteading and grazing have resulted in stream down cutting and lowered water tables. Except for a few water gaps, Monner Springs Creek has been fenced from livestock use within the last ten years,.

b) According to the soils report FEIS, Chapter 3, Section 3.5.2), "The effects of detrimental compaction associated with livestock are primarily shallow, short-lived, and seasonal in nature (David per. comm. 2004). … Detrimental compaction is present in some areas but is not as prevalent as once thought (David pers. comm. 2004). Natural remediation through frost action, shrub and deep-rooted grass establishment, the action of soil organisms, and rodents has helped to ameliorate the compaction of much of the surface horizons (upper 12 inches of the soil profile). Deeper compaction from old farming activity is likely to be far more persistent and is harder to assess with shovel probing". Soil compaction occurring on the North Boyce allotment would be consistent with this description.

c) While stripped juniper bark would certainly indicate the presence of animals, it is not necessarily indicative of "overgrazing". The FEIS measures annual residual stubble height (FEIS Chapter 2, Section 2.4.1) and species composition and soil condition (Chapter 3, Section 3.3) as accepted indicators of impacts to plant communities.

d) The soils report (FEIS, Chapter 3, Section 3.5.2) states, "[t]here are 205 existing water developments located on Grassland managed lands. Each water development is estimated to include approximately one acre of land immediately adjacent to the development that has detrimentally impacted soils associated with livestock use of the development. Impacts include compacted, displaced, and exposed soils. These areas are generally denuded of vegetation. The estimated 205 acres of detrimentally impacts soils associated with the existing developments is approximately 0.2 percent of the Grassland acres associated with grazing allotments". The cattle wallows in the North Boyce Pasture referred to in this comment are included in that 0.2 percent.

e) There has been no livestock grazing in the proposed forage reserves since 2001. Prior to that the Squaw Creek area was grazed by sheep. It is quite possible that the area in question was a historic sheep bedding ground in which case what the commenter observed is a legacy of historic activities (FEIS, Chapter 3, Section 3.3.2). Western juniper is also having a profound influence on the quantity and quality of grasses within the Squaw Creek area (FEIS, Chapter 3, Sections 3.1.2 and 3.2.2).

f) Depending upon the key species to be measured, allowable stubble heights for use prior to June 1 is two to three inches (FEIS, Chapter2, Section 2.4). Under a deferred grazing systems, plants in each pasture are grazed at a different growth stage. When these pastures are rotated over a series of years the effect of livestock grazing on individual plants is ameliorated (FEIS, Chapter 3, Section 3.9.3).

g) The streams referred to in North Boyce and South Schmoker are identified as Class 4 drainages (See FEIS, Appendix O for stream class definitions). Monner Springs is also classified as an intermittent stream, although short isolated segments are perennial (FEIS, Chapter 3, Section

3.6.2). While historic activities of homesteading and grazing have had tremendous and lasting impacts to the hydrology of the Grassland (FEIS, Chapter 3, Section 3.6.2), the magnitude of juniper encroachment may also be having a considerable impact on flows (FEIS, Chapter 3, Section 3.2).

h) Fencing of Willow Creek was completed in the mid to late 1980s. Currently the primary cause of bankcutting on Willow Creek is associated with "flashy" high water events during the late winter and early spring each year (FEIS, Chapter 3, Section 3.5.2)

i) Riparian obligate vegetation requires the presence of free water. With the exception of those small isolated portions of Monner Springs Creek that are perennial (FEIS, Chapter 3, Section 3.6.2), the streams in question are dry for a portion of the year.

The FEIS indicates that the only ecological degradation that may be attributed to current livestock grazing is associated with the Peninsula Allotment (FEIS, Chapter 3, Section 3.3.2). This allotment is closed under Alternatives A, C, and D (FEIS, Chapter 2, Section 2.3). Many of the situations cited by the commenter are attributable to past management activities, including intensive farming by the homesteaders.

Comment

"I hunted quail along Willow Creek one of the major drainages. It was extremely overgrazed. The fencing certainly was not working or was not being used or not inforced."

Response

The exclosure fencing around Grassland administered portions of Willow Creek was constructed in the early 1980s. The current rate of ecological condition improvement would suggest that heavy levels of grazing have not occurred within this riparian area for an extended period. Livestock did breech the exclosure in 2002 and 2003, with resultant slight levels of use. There are several unfenced sections of Willow Creek located on adjacent private lands.

GRAZING - RESTORATION

Comment

"Because livestock grazing and trampling are the major causes of damage to upland plant communities and western ecosystems, and because they are also the major factors preventing the recovery of these systems, livestock must be drastically reduced in numbers or completely eliminated for the restoration of these lands. This reduction is necessary for the prevention of likely re-degradation of vegetative communities after costly restoration efforts. The evidence is undeniable that the early grazing practices were highly destructive and that western public lands have improved since the abandonment of historic grazing practices. However, recent studies document that livestock grazing remains a key factor in the continued degradation of Forest Service uplands. See A. J. Belsky et al., *Survey of Livestock Influences on Stream and Riparian Ecosystems in the Western United States*, 54 J. Soil and Water Cons. 419 (1999). There is no way these lands can be fully restored or recovered without significant changes, including removal, in livestock grazing management."

Response

The vast majority of the article is related to the effects of riparian grazing which is not applicable to this FEIS. Over 90 percent of the riparian areas on the Grassland are fenced to exclude grazing, which this article recommends. The only portion of this article relating to the effects of grazing in

uplands is very general in nature and cannot be site specifically applied to the Grassland. In fact, a large portion of this paper attempts to refute existing literature which does not support the premise of the paper. Finally, the generalities presented associated with the effects of upland grazing have been extrapolated from many studies observing the effects of heavy grazing (typically considered to be between 60 and 80 percent utilization by weight). In the FEIS, Chapter 2, Project Design Criteria and Monitoring Common to Alternatives B, C and D (Section 2.4), the institution of a stubble height standard of 4 inches is expected to result in a maximum utilization level of approximately 45 percent, far below the "heavy grazing" classification. The Clustered Transect, Condition and Trend data as well as the NCRS 2001 Range Ecological Site Condition and Trend Survey data indicate conditions are improving (FEIS Chapter 3, Section 3.3.2).

Comment

"...livestock grazing will further create unnatural conditions favorable to future juniper spread.

Juniper is a native tree in the CRNG and throughout the greater bioregion. Junipers are utilized by a variety of native bird species, and fill a distinctive and essential niche in the area's ecosystems. If both fire suppression and livestock grazing are not significantly curtailed, young juniper will quickly re-establish themselves, and any beneficial impacts of the planned thinning of young juniper will be pyrrhic in nature--soon lost in the transitory and changing nature of time-- if not endlessly repeated. Eliminating livestock grazing, restoring and replanting native vegetation including grasses, and restoring periodic fires will help create the natural conditions to return juniper, and indeed the entire CRNG ecosystem, to within their historical ranges of variability once again. Restoration of native grass and plant species, which cannot truly be accomplished without eliminating livestock grazing and returning periodic fires, will allow native vegetation to compete with and curtail the spread of juniper beyond natural levels, returning the grassland to a natural self-managing ecosystem which does not require the costly management actions now being proposed nor the continued subsidy of a few errant ranchers."

Response

The Purpose and Need section identifies the following needs: social and economic, more deep-rooted native grass species, less juniper (density and distribution) and maintenance of sagebrush steppe, and eliminating grazing on three allotments and part of another. Grazing practices in Alternative C and D were developed in part to accelerate the ecological recovery where conditions are improving under existing management or where ecological trends are static. The potential for livestock to cause a downward ecological trend was recognized and identified as a significant issue. Alternative D was developed, in part, to address this issue. The Design Criteria for Alternatives C and D were also developed to ensure that livestock use would not result in any ecological damage. The FEIS, Chapter 3, Ecological Trends section (Section 3.3) describes ecological trends and the relationship with livestock use. Moreover, this data suggest that over 90% of the measured sites are in stable or improving conditions. Where conditions are not improving, Alternative C and D propose changes in the grazing system to initiate improving conditions. The vegetation treatment actions (treatment of 50,000 acres of juniper, and seeding of up to 10,000 acres in the Proposed Action (Alternative C) in concert with the currently improving ecological conditions, and the changes in grazing systems where needed , will result in the very conditions the commenter suggest we will lose. Where relevant, the environmental effects discussions for other resources (e.g. soils, water, etc.) disclose the effects of livestock use on that resource.

GRAZING - SUITABILITY

Comments

"Abundant ample acreage for livestock grazing exists outside the grassland which is more suitable for livestock grazing. The private economic profits of 23 permittees should not be allowed to take precedence over the desire of the majority of the public to protect the native biodiversity of the national Grasslands ecosystem, and to provide for natural forms of recreation suited to the continued conservation and protection of this area."

"The allotments planned for cancellation due to livestock damage should be permanently closed to livestock use. The other CRNG allotments should be phased-out as soon as possible. Ranchers need to be weaned off the CRNG as a subsidy to their operations. The CRNG's fragile thin desert soils are unsuitable for livestock grazing."

"ONRC is concerned that the FS has not yet completed grazing suitability analysis as required by the NFMA planning regulations. Read an respond to the attached report on grazing suitability prepared and distributed by AFSEEE (now FSEEE) in 1995. We think that a carefully conducted grazing suitability analysis will reveal that this area is not suitable for livestock grazing, especially not at the levels proposed by the USFS."

Response

Controlling legislation (FEIS, Chapter 1, Section 1.3), including the Bankhead-Jones Farm Tenant Act of 1937, recognize domestic livestock use as a legitimate use of National Grasslands. The Purpose and Need section identifies the following needs: social and economic, more deep-rooted native grass species, less juniper (density and distribution) and maintenance of sagebrush steppe, and eliminating grazing on three allotments and a portion of another. Grazing practices in Alternative C and D were developed in part to accelerate the recovery of ecological conditions where conditions are improving under existing management or where ecological trends are static. The potential for livestock to cause a downward ecological trend was recognized and identified as a significant issue. Alternative D was developed, in part, to address this issue. The Design Criteria for Alternatives C and D were also developed to ensure that livestock use would not result in any ecological damage. The FEIS, Chapter 3, Ecological Trends section (Section 3.3) describes ecological trends and the relationship with livestock use.

The capability and suitability for grazing on the Grassland has been analyzed using the NRCS 2001 Ecological Site Condition and Trend Survey data and by consideration of the LRMP Management Area direction. However, this analysis was not clearly articulated within the DEIS, so additional language is included in the Forage Production/Livestock Use section, Chapter 3 of the FEIS. Existing LRMP management area direction designates approximately 5,700 acres within the Grassland as unsuitable for livestock grazing such as Research Natural Areas, Crooked River Recreation Area, Deschutes River Scenic Corridor, Squaw Creek (scenic portion), Haystack Reservoir, and the Cove Palisades State Park. The Ecological Site survey data indicates that an additional 850 acres (approx.) are "not capable for grazing". Alternatives A, C and D close additional acreage to domestic livestock grazing which would further limit the portion of the Grassland determined to be "suitable" for grazing.

Cancellation is a very specific term reserved for a type of action which is taken against a Term Grazing Permit. Closure is another specific term associated with an action taken associated with a portion of land (often pasture or allotment) where livestock grazing is ceased until such time as a future analysis authorizes the resumption of livestock grazing. Alternatives A, C and D within the FEIS (Chapter 2, Section 2.3 and Appendix A, maps 11 and 12) propose closure of different areas (pastures, allotments and/or portions of pastures or allotments).

The Economic and Social section (Chapter 3, Section 3.1.5) of the FEIS provides an extended discussion of the economic and social impacts associated with grazing on the Grassland. In addition, the effects of grazing on recreational activities are disclosed within the Recreation section of Chapter 3 of the FEIS. The increasing levels of recreational use of the Grassland would indicate that the presence of livestock grazing does not eliminate recreation activity.

Comment

"You're having to close the Peninsula, Clevenger and Gold Mine/Falls areas because they are cow-burnt, which reinforces my point about cows not being suited here."

Response

The FEIS (Chapter 1, Section 1.4.2) indicates that the need to close the Clevenger and Goldmine/Falls Allotments is based on: lack of demand, lack of infrastructure (fences and water developments), limited size, and location within the Middle Deschutes Wild and Scenic River corridor. The FEIS, in the same section, indicates that downward ecological trend (associated with livestock grazing) is one of several reasons for closure of the Peninsula Allotment.

GRAZING - TRENDS

Comment

"Given the significant adverse impacts resultant from livestock grazing, when the agency states that grazing conditions are "stable" or are "showing an improving trend" the question reasonably arises as to what baseline comparison the agency is utilizing to arrive at it's conclusive pronouncements of "stable" and "improving"? Is the agency using a baseline of extreme degradation as comparison, as it is definitely clear it cannot be comparing the current degraded situation to anything within the historical range of conditions which occurred within the area naturally? Relative and subjective pronouncements of "stable" and "improving" without disclosure of their baseline comparison are not only misleading, obfuscating the many significant current adverse impacts ongoing due to livestock grazing's depredation, such conclusions provide for the failure of the agency to rectify these management induced harms, misinform the public, and violate the requirements of the NEPA concerning scientific and site-specific accuracy in public NEPA analysis documents. These failures need to be corrected, and the actual conditions fully disclosed, during this NEPA process before an ethically, ecologically and legally acceptable decision may be reached."

Response

When used in relation to trends, the terms, "stable", "static", "improving", "upward", "declining", and "downward" indicate a direction of motion or change. In the determination of actual trend (generated from periodic readings from Clustered Transect data) no baseline is used, but is based upon a measurement at one point in time as compared to a measurement at another point in time. A baseline is not used in the determination of apparent trend (generated for Ecological Site Write-ups) either. Apparent trend is based up a single reading in time which evaluates factors which would indicate a change occurring in condition (active downcutting, vegetative recolonization of disturbed areas, a large amount of recent recruitment of desirable late seral species, etc.). On the other hand a determination of condition (ecological, forage, soil stability, etc.) is based upon a comparison to a baseline. Baselines used for condition determinations are described extensively throughout each resource area in Chapter 3 of the FEIS.

Comment

"We suggest a change in grazing system for those allotments still in a downward trend. During the current drought, we support a reduction in AUM's as a way to improve trend rather than grazing vacant allotments that are improving as a result of being rested."

Response

The FEIS, Chapter 3, Ecological Trends section (Section 3.3) indicates the following trends and associated causative factors:

- The Peninsula Allotment - a downward ecological trend associated with overuse by livestock over the past 20 years. This allotment would be closed under both Alternatives C and D.
- Boyce, Grizzly, Rush, Fox, Lone Pine, allotments- downward forage trends associated with the replacement of old seedings with less productive native grasses like Sandburg's or bulbous bluegrasses. These areas would be reseeded with more productive, deep-rooted, bunchgrasses under both Alternatives C and D.
- Cyrus Allotment- downward soil stability index trend associated with increased western juniper densities. Western juniper stands which are impacting understory vegetation on this allotment would be treated under both Alternatives C and D.

In all cases the causative factors for the downward trends are addressed through actions proposed within Alternatives C and D. Where livestock grazing/management has been identified as a causative factor (the Peninsula Allotment) the grazing system has been altered (other allotments would be closed but not for condition/trend reasons). In addition, within the action alternatives the grazing system has been altered by eliminating regrazing on all allotments on the CRNG with the exception of the Haystack Allotment and by incorporating rest into many of the rotation systems (FEIS, Chapter 2, Sections 2.3.3 and 2.3.4).

GRAZING – WILDLIFE - GENERAL

Comment

"The actual situation current in the CRNG is unacceptable, with conditions clearly indicating the fragility of the landscape and its vulnerability to the severe impacts of an exotic species (domestic European-stock cattle) which weighs tons and concentrates in riparian areas. Cattle can easily out-compete deer, pronghorn and smaller herbivores for forage. Native bunchgrass species are obviously declining due to grazing pressure from livestock. Sagebrush and juniper encroachment are also due in large-part to heavy livestock grazing of grasses, not just to fire suppression."

Response

More than 90 percent of the Grassland riparian areas were fenced to exclude livestock grazing over ten years ago.

Many grazing changes are proposed in the FEIS (Chapter 2, Sections 2.3.3 and 2.3.4) to improve habitat quality for wildlife species. Effects of cattle grazing on wildlife for all proposed alternatives (including allotment closures) are found in Chapter 3 of the FEIS under the Proposed, Endangered, Threatened, and Sensitive Species and Wildlife sections.

There are existing standards and guidelines in the LRMP which limit grazing levels in pronghorn and mule deer winter ranges (LRMP p. 4-75-76). In addition, a project design criterion and additional monitoring for winter ranges are added to the FEIS (Chapter 2, Section2.4.3).

Comments

"ODFW is also concerned that: 90% of the 83,000 - 88,000 acres open to grazing annually will limit wildlife productivity and associated economic and recreational benefits, …"

"…Table 3-28…show's that under Alternative C, 74,590 acres would be grazed each year (74,590/82,923 = 90% would be grazed leaving 10% ungrazed), and under Alternative D, 79,752 acres would be grazed each year (79,752/88,085 = 90% would be grazed leaving 10% ungrazed). Retaining 10% of the allotments in an ungrazed condition annually WILL NOT CHANGE EXISTING CONDITIONS for wildlife dependent on ground cover for foraging and reproduction…ODFW recommends that a *significant* portion of the 55,592 acres of native plant associations identified (DEIS Chapter 3 page 77) be rested annually to provide habitat for wildlife reproduction.

Please clarify, by allotment and alternative, the number of acres not to be grazed each year compared to existing permitted use. Also, please verify that the wildlife assessment was based on the number of acres proposed to be grazed – 70% or 90% of available acres to be grazed annually."

Response

In the FEIS, Table 3-28 in Chapter 3 shows actual acres grazed (taking into account rest pastures) by alternative. They are: Alt A - 0, Alt B - 102,938, Alt C - 82,975, Alt D. - 79,752. The Wildlife section in Chapter 3 displays the effects of cattle grazing on, habitat specialists, neotropical migratory birds, raptors, big game, and management indicator species. While reviewing this table, an error in ungrazed acres was identified. It is corrected in the FEIS.

Table 3-28 is modified and corrected to help clarify the grazed vs. ungrazed percentages on the Grassland. In Alternative C, 33 percent of the Grassland is proposed to be ungrazed. In Alternative D, 29 percent of the Grassland is proposed to be ungrazed. Refer to FEIS, Chapter 3, Wildlife, Habitat Specialists (Section 3.7.2) for effects of the additional rest pastures to habitat specialists.

GRAZING – WILDLIFE – MULE DEER WINTER RANGE

Comments

"[The Department recommends] (2) the maintenance and restoration of primary winter range for mule deer…, the Department now recommends closure of the Lower Desert and Canadian Bench allotments for this purpose."

"In the FEIS, the Department recommends the proposed Lower Desert allotment… be eliminated from livestock grazing. The Lower Desert allotment provides important habitat for wintering mule deer."

"ODFW is also concerned that: not identifying a cost-effective method to monitor livestock utilization of bitterbrush on mule deer winter range could result in over utilization of bitterbrush needed by wintering mule deer."

"ODFW supports Alternative C … with the following modifications:
Lower Desert Forage Reserve- close Lower Desert allotment to conserve bitterbrush for wintering mule deer …No monitoring protocol was identified in the DEIS to measure utilization of bitterbrush by livestock."

"…, a take off date of August 1st to protect bitterbrush is not early enough during drought conditions."

"ODFW supports Alternative C … with the following modifications:
Holmes-Williams Allotment - ODFW continues to recommend closure of the Williams Allotment."

Response

Alternative A analyzes the effects of closing allotments on mule deer winter range (FEIS, Chapter 3, Section 3.7). However, there is only a small portion of the Canadian Bench allotment included within the allocated Metolius Mule Deer Winter Range (MA-G2). NRCS ecological site write-ups completed in 2001 indicated the only area in a degraded and downward trend associated with livestock grazing was the Peninsula Allotment. NRCS ecological trends are upward on Lower Desert and static on Canadian Bench. Chapter 2, Alternatives, Alternative C (Section 2.3.3), of the FEIS describes cattle grazing proposed on the forage reserves within winter range to protect bitterbrush. Project design criteria for grazing in the winter range, which are incorporated into the FEIS, include the provision for removing livestock prior to August 1 if climatic factors require it (FEIS, Chapter 2, Section 2.4). Primary maintenance and restoration of the winter range will be accomplished through juniper treatments.

GRAZING – WILDLIFE – CALIFORNIA BIGHORN SHEEP

Comments

"The Department recommends, closing the Canadian Bench allotment, or specifying that the allotment will be closed if bighorn sheep are reintroduced to their historic habitat."

"ODFW is concerned that:
creation of a forage reserve on Canadian Bench targeted for sheep could preclude reintroduction of California bighorn sheep, …"

"ODFW supports Alternative C … with the following modifications:
Canadian Bench Forage Reserve - close the Canadian bench allotment due to disease transmission from domestic sheep to wild bighorn sheep … Or specify in the ROD that the allotment will be closed when existing barriers for reintroduction of California bighorn sheep have been removed."

Response

This comment was addressed through the original scoping process by the removal of the forage reserves to create Alternative D. Effects of domestic sheep on California bighorn sheep are evaluated in the FEIS, Chapter 3, Habitat Specialists (Section 3.7.2).

JUNIPER - HISTORIC RANGE OF VARIABILITY

Comments

"… we believe you over estimate the amount of juniper acres that historically occupied the Grasslands. Even alternative C does not take an aggressive enough step at controlling juniper in order to conserve the native sagebrush steppe habitats and the wildlife species that depend on them."

"The EIS's analysis and alternatives must be revised to incorporate the actual historic and current distributions of juniper on the CRNG, in order to avoid overestimating the environmental damage

caused by juniper. This information should be viewed in relation to land use practices that have caused or contributed to the spread of juniper."

"…we question the assumptions used to calculate the range of variability model for juniper acreages. We believe the historical juniper acreage on the grasslands has been over-estimated."

"Even alternative C does not take an aggressive enough step to control juniper in order to conserve the native sagebrush steppe habitats and the wildlife species that depend on them."

Response

The FEIS Chapter 3, Historic Range of Variability section (Section 3.1) describes the 1994 Viable Ecosystems Management Guide (VEMG) model upon which the historical occupancy of western juniper on the Crooked River National Grassland (CRNG) was based. The actual estimates of various seral/structural stages are displayed within Table 3-4 (FEIS, Chapter 3). As this discussion implies, juniper management within the CRNG as defined and delineated in the Land and Resource Management Plan for the Crooked River National Grassland (LRMP) is a reflection of the VEMG model. However, the FEIS (Chapter 3, Section 3.1) clearly provides for the incorporation of new knowledge as follows, "Given the vagaries of nature, the differential responses of vegetation to treatment, and knowledge that is sometimes incomplete, there will always be a need to make mid course adjustments. Watersheds will need to be re-evaluated at periodic intervals to determine the changes that have occurred and to re-assess the existing conditions that are expected to be very dynamic over time. The desired condition may ultimately be a 'moving target' that is sought but never achieved, serving mainly as a means of directing or focusing management activities. The reliance on monitoring and adaptive management will be critical in order to challenge our assumptions, knowledge base and to achieve responsible management of resources". While the data necessary to alter the VEMG model has not been collected, an opportunity for the formal evaluation of the baseline information it provides will occur with the LRMP revision which is scheduled to begin in 2006.

Alternative C moves vegetation within its historical range of variability in the short term. Weather or not the EIS overstates the amount of juniper that occurred historically, the 50,000 acres of juniper treatment proposed in Alternative C over a ten year period is very aggressive given our average of treating 2 to 3 thousand acres per year. Continued management would be necessary to maintain vegetation seral status and distribution within this range.

Comments

"<u>Page 123, First paragraph, second to last sentence</u>: The Department expects that most of the treatments in Alternative C would be to move seral/structural stages back towards the historic range of variability. This may include complete removal of juniper in areas where it has degraded shrub-steppe habitat conditions."

Response

Of the proposed treatments in the FEIS, 80 percent include the removal of juniper from grass and shrub stands to address shrub-steppe habitat degradation. There are however also deficiencies in the L4b and L5b stages on the Grassland. Of the proposed treatments 20 percent focus on thinning juniper woodlands to move closer to HRV for this desired seral/structural stage (FEIS, Chapter 3, Section 3.0). These types of treatments were selected in stands which have already been converted to juniper woodlands. The desirable shrub layer has already been substantially reduced.

JUNIPER - OLD GROWTH

Comments

"We strongly recommend altering the official old growth designated areas to reflect old growth juniper sites located on ridge tops and in rocky areas where fire didn't reach. Old growth juniper sites exist on the Grasslands and these designated areas need to reflect that."

"Many of the officially designated old growth juniper areas on the Grasslands are actually sagebrush steppe habitat types. Western juniper is able to occupy these sites with the decreased fire frequencies. There is **no** evidence of old growth; junipers growing on these sites are relatively young. Due to the frequency of historical fires, western juniper would not have occupied these sites."

"We strongly recommend altering the official old growth designated areas to reflect traditional historic sites located on ridge tops and in rocky areas where fire didn't reach. Old-growth juniper sites do exist on the Grasslands and these designated areas need to reflect that distribution."

Response

The FEIS, Chapter 3, Western Juniper and Old Growth Forests, Existing Condition, Old Growth Juniper (Section 3.2.2), indicates that, "Designated old growth juniper is a LRMP management area allocation (MA-G5). There are 15 designated old growth juniper management areas spread across the Grassland. Each management area is at least 40 acres in size and no more than five miles from another block. Each block may or may not contain biological old growth. Those that do not currently contain biological old growth were selected because the specific site contained the stands that could be managed to become old growth. All MA-G5 blocks are managed for old growth habitat conditions." This section also identifies the distinction between biological and designated old growth western juniper. Altering the designation of western juniper old growth (an LRMP action) is outside of the scope of this analysis. The Historic Range of Variability, Affected Environment (Section 3.1.2), Chapter 3, FEIS states, "In 2006, when the LRMP is revised, old growth designated areas and their management will be re-visited."

Comments

"Existing juniper old growth sites on the Grasslands are in need of management. Encroachment of young trees between the old growth increases fuel loads that increase the risk of catastrophic fire and will threaten these old growth stands. We would like to see some aggressive thinning proposed in these areas."

"Even existing juniper old growth sites on the Grasslands are in much need of management. Encroachment of young trees between the old growth increases fuel loads that increase the risk of catastrophic fire and will threaten these old growth stands. We recommend immediate thinning in these areas to remove young trees."

Response

The verbiage within the FEIS clearly identifies that no biological or designated old growth western juniper stands will be treated, particularly none occurring within Sherwood Canyon. The FEIS, Chapter 3, Western Juniper and Old Growth Forests, Environmental Effects (Section 3.2.2), Old Growth Juniper section states, "[a]lternatives C and D prescribe some (less than 500 acres) thinning to existing mid-late juniper woodland stands with the desire of advancing the stand toward old growth. The effect would be to move succession from mid and early seral toward late seral or old growth." In order to maintain consistency the treatment of Unit 71 will be dropped from

Alternative C. This would not preclude the CRNG from conducting old growth western juniper stand maintenance under some future analysis.

Comment

"In most of the grazing allotments the average diameter breast height (dbh) of juniper is only 2.5" to 4" with the exception of the few areas where there are older established juniper woodlands. A student in Prineville, Oregon measured the yearly growth rings of an old growth juniper tree near Prineville and found that it can take 35 years for a juniper tree to achieve one inch of radial growth. The elevation, soil and climatic conditions in the Prineville area where these measurements took place are similar to those found within the CRNG. If the student's findings are applicable to the CRNG junipers as well, then it may take a juniper tree up to 35 years to achieve 2" of diameter growth. This means that at 14" dbh juniper may be up to 245 years old. This is far older potentially than any "encroachment" juniper, since the advent of fire suppression occurred about only 80 years ago (and livestock grazing of the area didn't fully begin in earnest until the late 1800's). Even doubling the Prineville student's growth figure, to 4" of diameter growth per year, a 14" dbh juniper average age estimate would be 122.5 years old--near, but still before, the advent of fire suppression--placing this size class of juniper, on the average at approximately 5" dbh 80 years ago, within the natural cyclic periods of juniper growth and establishment. It is possible that some of these trees may have been killed by periodic fires, fires which did not occur due to suppression efforts.

More research is needed to firmly establish how widespread and effective any actual fire-suppression efforts actually were and how many actually occurred within the CRNG area. The fire suppression research also needs to be co-related with fires which may have been set by ranchers to create more clearings for livestock pasture, as has been documented to have occurred as well, as this -- if occurring within the CRNG area -- would have potentially resulted in additional juniper mortality rather than encroachment,. Without thorough and accurate research (which is in part the Congressional intent on NEPA process), and the full disclosure of the results -- including unknowns and omissions -- of this research within the EIS, the assertion of the agency are unfounded speculation subject to the often erroneous and prevailing hypotheses of these times."

Response

Appendix W has been added to the FEIS which summarizes the literature used in the Western Juniper and Old Growth Forests existing condition and effects discussions (FEIS, Chapter 3). Across the Grassland there is a very limited presence of "old" (>200 years) western juniper trees present, with the vast majority of trees less than approximately 120 years old. Unlike many other tree species, the age of western juniper does not have sound correlation with diameter, or tree height. Instead, "old growth" juniper is most soundly expressed by growth form. That is, while younger, actively growing western juniper trees may have greater diameters or heights, their growth form may be described as "pointed topped". Conversely, "old growth" juniper typically occurs on very rocky, harsh sites where their diameters and height are limited, but their growth form may be described as "flat topped" (Miller, R.M. 1995), or spherical (Agee 1993). The FEIS, Chapter 3, Western Juniper and Old Growth Forests (Section 3.2) lists additional characteristics of biological old growth juniper trees.

A discussion concerning western juniper expression on the landscape as it relates to fire is also included within the FEIS, Chapter 3, Western Juniper and Old Growth Forests (Section 3.2) and Appendix W.

Comments

"Until such research is concluded, we recommend that no irretrievable actions, such as cutting junipers above 10" dbh, should occur within the CRNG. Scientific research by Joy Belsky concluded that cyclical expansions of juniper across the landscape are historically a natural phenomenon of the area's ecosystem. Joy's research also indicated that the current extensive spread of very young juniper (2" to 4.5" dbh) may in part be attributed to the diminishment of native grasses and plant species by extensive livestock grazing.

As the survey work of our organization has found across the CRNG, the average dbh of young, apparently "encroaching" juniper trees is only 2" to 4.5". We suggest that the ecological goals of the agency for the area regarding juniper would best be met by an initial program of juniper thinning which mimics the effects of historical natural fires, with a conservative upper cutting limit dbh of 8," with any juniper trees exceeding this diameter left in place pending further research, analysis and public NEPA review. Setting this upper dbh limit for juniper cutting will give ample latitude to clear most juniper representing plausible juniper "encroachment" from fire suppression and/or livestock grazing.

This program should also be complimented with management which addresses the crux of the ecological issues in the CRNG, that of permanently eliminating livestock grazing from the area. Together, along with needed restoration of native plant species and eroding stream banks, and the careful reintroduction of fires, these management actions will allow the CRNG to become the conservation treasure intended by Congress when the area received its designation."

"…, the CRNG should protect and conserve those areas--especially areas of old-growth juniper--that actually increase biodiversity by increasing the number and diversity of birds, mammals, reptiles, and insects that are dependent on juniper for berries, foliage, perches, thermal cover, and other woodland features. No old-growth juniper should be removed or otherwise treated, regardless of their particular dbh. This requires a more accurate, site-specific assessment of the ranges of annual radial growth found throughout the CRNG."

Response

The FEIS, Chapter 2, Alternatives C and D (Section 2.3.3 and 2.3.4) indicate that no biological or designated old growth juniper will be treated. The FEIS Chapter 3, Western Juniper and Old Growth Forests, Affected Environment (Section 3.2.3) defines biological old growth. The FEIS Map 16-LRMP-Management Areas identifies designated old growth management areas. While altering the designation of western juniper old growth management areas is outside of the scope of this analysis, the Historic Range of Variability, Existing Condition section of the EIS states, "In 2006, when the LRMP is revised, old growth designated areas and their management will be re-visited". The FEIS, Appendix E provides unit specific treatment descriptions including diameter limits. While domestic livestock grazing may influence western juniper establishment, establishment rates suggest that, regardless of disturbance regimes, other driving mechanisms have become more dominant (Soule et.al. 2004) (FEIS Appendix W).

In addition, designation of the National Grasslands in 1960 did not result in a withdrawal of these lands as a commons or preservation as an ecological treasure. Title 36 of the Code of Federal Regulations, § 213.1, states that the National Grasslands "shall be administered under sound and progressive principles of land conservation and multiple use, and to promote development of grassland agriculture and sustained-yield management of the forage, fish and wildlife, timber, water and recreational resources in the areas of which the National Grasslands are a part."

Comment

"The agency needs to exercise care in its prescribed burning efforts that ensure the survival of old growth junipers which play a critical role in providing habitat for numerous species throughout the CRNG."

Response

There is a project design criterion identified specifically for protecting biological old growth juniper in the FEIS (Chapter 2, Section 2.5.5).

JUNIPER - CURRENT RESEARCH

Comment

"The goal of restoring the CRNG to within its historical range of vegetative variability is ecologically laudable. To successfully accomplish this goal however, the broad-scale treatment of western juniper must be tempered by current scientific research on the issue, including the current and historic causes of juniper expansion. Land managers throughout the interior western United States often have relied heavily on assertions that the spread of western juniper reduces water infiltration, dries up springs and streams, increases erosion, reduces biodiversity, and reduces livestock and wildlife forage, in order to support large-scale juniper control on public and private lands. While it is clear that juniper woodlands have expanded greatly in the past century, it is not necessarily a foregoing conclusion that these expansions are one-hundred percent undesirable."

Response

In the late 1990s scientists working for the Interior Columbia Basin Ecosystem Restoration Project (ICBEMP) analyzed changes in vegetation throughout the Columbia River Basin over the last 100 years. They determined that wheatgrass-bunchgrass, fescue-bunchgrass and big sagebrush cover types have decreased (66-75%, 53-92% and 84%, respectively) throughout the region. At the same time, they found an increase in the juniper-sagebrush cover type (163%) had occurred. These findings led the scientists to identify the sagebrush steppe ecosystem as an imperiled habitat in the Columbia River Basin. A similar trend is occurring throughout Central Oregon and on the Crooked River National Grassland. Since the turn of the century, western juniper has been actively expanding its range into adjacent shrublands and grasslands. Of the more than 2.3 million acres of juniper woodland in Oregon, nearly 90% is composed of young woodlands with trees less than 150 years old. The FEIS proposes to treat up to 49,000 acres of juniper. Of these, 40,879 acres or 84 % are shrubland and grassland habitats into which young juniper have become established but are not yet a dominant feature (i.e., these areas are not currently considered juniper woodland). Cutting the juniper in these areas will maintain this existing amount of shrubland and grassland habitat and does not affect the extent of juniper woodlands. The remaining acres proposed for treatment are classified as M3 and L4 using the Ochoco National Forest's Viable Ecosystem Guide. The M3 cover type is comprised of junipers that are 5 inches to 8.9 inches in diameter (pole sized trees) and the L4 cover type of that are 9.0 inches to 20.9 inches in size. The proposed treatments would reduce the extent of the M2 and M3 cover types by 4,270 acres in 10 years and 10,237 acres in 30 years (Table 3-5 and 3-6). This reduction in extent is not deemed to be significant, given the abundance of juniper in central Oregon. Conversely, grasslands and shrublands have declined greatly and are a priority for preservation.

Comments

"The best way to address juniper encroachment is to reduce grazing, build fine fuels, and reintroduce fire. The scientific basis for juniper control is highly questionable. Juniper will take care of itself after you remove livestock and reintroduce fire. See below.

Many ranchers, rangeland managers, and range scientists in the Pacific Northwest consider western juniper (Juniperus occidentalis Hook.) to be an invading weed that reduces water infiltration, dries up springs and streams, increases erosion, reduces biodiversity, and reduces the quality and quantity of forage for livestock and wildlife species. Although there is little scientific evidence supporting most of these beliefs, they are currently being used as rationales for controlling juniper on public and private lands. Similar views were held about the pinyon-juniper woodlands in the Southwest and Great Basin from the 1940's through the 1960's, when efforts were also made to control woodland expansion.

Pressures to control the further spread of western juniper and to reduce its density in woodlands are increasing. Because of the paucity of information on the environmental effects of western juniper expansion in the Northwest, this paper primarily reviews evidence from earlier studies of pinyon-juniper woodlands in the Southwest and Great Basin. These studies rejected similar assumptions about the deleterious effects of pinyon-juniper expansion on ecosystem properties and call into question current rationales for controlling western juniper in the Northwest. These studies also suggest that while the expansion of juniper might alter species composition and decrease herbaceous biomass in grasslands and shrublands, they have few detrimental effects on streamflow, aquatic organisms, soil properties, or wildlife habitat.

…[P]opular conclusions about junipers ignore many of the complexities of natural ecosystems, including the following:

1. In arid and semi-arid climates, most snow and rain water simply recharges the soil column; little excess is available to move downslope to streams (Hibbert 1983, West 1984),
2. Herbaceous plants and shrubs that replace trees also intercept rain and snow, reducing the amount of water reaching the ground;
3. Replacement plants also transpire and deplete soil water (Clarey et al. 1974, Brown 1987a);
4. Tree removal exposes soils and understory plants to direct sunlight, causing elevated temperatures and increased evapotranspiration (Clarey et al 1974, Everett and Sharrow 1985);
5. Tree removal exposes soils and understory plants to more wind, which increases evapotranspiration (Clarey et al 1974, Everett and Sharrow 1985);
6. In areas where water is in excess of that needed to recharge the soil, this water may go to shallow aquifers rather than to streams (Hibbert 1983).

In other words, studies showing that juniper intercept precipitation and transpire water (Young and Evans 1987, Eddleman and Miller 1992) cannot be used to conclude that this lost water would have ended up in streams and springs. To do so, water budgets of juniper–dominated and juniper-free sites would have to be compared, or long-term changes in streamflow following juniper removal measured.

A. JOY BELSKY, Viewpoint: Western juniper expansion: Is it a threat to arid northwestern ecosystems? Journal of Ranger Management 49:53-59 January 1996, pp.53-59…"

Studies of pinyon-juniper woodlands throughout the Southwest and the Great Basin have rejected similar assumptions about the ecological degradation of juniper expansion. See A. J. Belsky,

*Western Juniper Expansion: Is It a Threat To Arid Northwestern Ecosystems?,*49 J. Range Mgmt. 53 (1996)."

Response

There is a considerable amount of knowledge and research regarding western juniper and its current expansion in the Pacific Northwest. Appendix W summarizing this existing literature has been added to the FEIS. Although reductions in effective site moisture associated with increased juniper cover (Bedell et.al. 1994, Miller and Wigand 1994, Eddleman and Miller 1991) may or may not be diverted to streams and springs in the event of juniper treatment, there is no question that western juniper densities reduce understory cover and biomass (Belsky 1996, Miller and Wigand 1994, Eddleman 1995, Vaitkus and Eddleman 1991, Gedney et.al. 1999). This in turn leads to increased:

- erosion and overland flow (Eddleman and Miller 1995, Miller and Wigand 1994),
- nutrient sequestering (Doescher, Eddleman and Vaitkus 1987, Miller and Wigand 1994),
- soil chemistry alteration (Doescher, Eddleman and Vaitkus 1987), and
- soil surface and subsurface temperatures (Buckhouse 1995).

These factors influence fisheries and wildlife habitat (FEIS, Chapter 3, Sections 3.6 and 3.7). On sites where juniper has not encroached or has been treated, effective moisture is available for the growth of historic vegetation which maintains site productivity, in so doing, maintaining future management options.

The effects of western juniper encroachment are discussed in the Western Juniper and Old Growth Forests section (FEIS, Chapter 3, Section 3.2).

Comments

"Livestock, by annual elimination of herbaceous cover, can cause many of the same effects as juniper encroachment, and many other effects that are far more deleterious. We propose the agency remove livestock and reintroduce fire before controlling juniper. By removing livestock maybe the herbaceous component can increase enough to carry fire and kill some of the juniper trees to reestablish a mosaic of fire driven seral development."

Response

The effects of livestock grazing under current management as well as under proposed management regimes (Alternatives B, C, and D) are discussed under each of the sections of Chapter 3 within the FEIS. The effects of the removal of livestock are discussed under each section of Chapter 3 of the FEIS in relation to Alternative A. The effects of western juniper encroachment are not equivalent to those associated with grazing.

JUNIPER - WILDLIFE

Comments

"ODFW supports Alternative C … with the following modifications:
Holmes-Squaw Creek Allotment - modify unit 67 to only burn 1/3 while using mechanical means to remove juniper on the remaining 2/3rds."

"Supporting [modified treatment in unit 67] is a protocol ODFW developed with the Bend Fort Rock Ranger District, Deschutes National Forest to use when treating shrubs in mule deer winter range. The protocol specifies that no more than 1/3 of the bitterbrush be in an early seral condition, with the remaining 2/3rds be in a mid to late seral condition."

Response
Unit # 67 (included under Alternative C and described in Appendix E) is modified in the FEIS to treat 1/3 of the unit through prescribed fire and 2/3 of the unit by chain saw.

Comment

"ODFW supports Alternative C … with the following modifications:
50,000 acres of Western Juniper Management and Control - retain some juniper for wildlife benefits. Retention levels will depend on site and focal wildlife species. An excellent 8-page reference publication is titled Managing Western Juniper for Wildlife by Rick Miller..."

Response
A review of this document shows that Alternatives C and D are consistent with the recommendations in *Managing Western Juniper for Wildlife* by Rick Miller. Management observations/suggestions made in this publication that are consistent with the proposed activities in the FEIS are:

- "Small mammal populations, including the desert cottontail, have increased where the slash remains on the ground after cutting of juniper trees."
- "Maintain five to twelve full size trees per acre or less than 10 percent tree canopy cover. On less productive sites…less than five percent tree canopy cover will allow vigorous understory growth."
- "When thinning a stand, leave old growth trees."
- "Plant communities having a good composition of perennial native plants respond very well after fire…Do not burn juniper communities that have limited understory native plant species or an understory of exotic plants such as cheatgrass or medusahead."
- "Most [seeding] success occurs where workers can drill seed into the ground at the proper depths."

JUNIPER - MISCELLANEOUS

Comments

"Junipers are a large nocuous (sic) weed and need to be controlled."

Response
The "noxious farm weed" designation authority is within the jurisdiction of the United States Department of Agriculture and the State Department of Agriculture (FEIS, Chapter 3, Section 3.13). Western juniper (*Juniperus occidentalis*) has not been designated "noxious" by either entity.

Comment

"A significant portion of the nutrients in juniper-rangeland ecosystems are contained in the Juniper trees. Cutting and removal of the juniper trees can cause long term depletion of the critical nutrients."

Response
None of the alternatives within the FEIS propose the removal (off-site) of western juniper trees. While prescribed burning is known to volatilize nutrients such as nitrogen that are contained within plant materials, lopping and scattering and delaying burning for seven to eight years post treatment

where other resource conditions dictate (FEIS, Chapter 2, Section 2.5), will allow for the vast majority of nutrients (especially nitrogen) tied up in foliage to leach into the soil profile.

Comment

"The CTWSRO also suggests that the Grassland look for a way to utilize cut junipers. Biofuel may be an option. A demonstration project last year on the Grassland provided Juniper to Warm Springs Forest Products Industries for co-power production."

Response

The Crooked River National Grassland is currently pursuing partnerships in developing the market for western juniper projects. This includes conducting a biofuel feasibility project in cooperation with the Warm Springs Confederated Tribes of Oregon. However, these partnerships are being pursued outside of this analysis effort. Proposals for utilization of biomass would be assessed through separate, subsequent analyses.

Comment

The EIS should present the "more important" information about juniper. Such as the understory environment that is created with juniper establishment and density increases.

Response

The FEIS, Chapter 3, Western Juniper and Old Growth Forests, and Appendix W -Western Juniper Report, summarize understory vegetative effects associated with increased juniper range and density.

MISCELLANEOUS

Comment

"We are concerned that the round-up ready bentgrass being proposed for the Madras/Culver area will negatively affect the Grasslands. Bentgrass from these sites could/will escape and is capable of invading onto the more mesic Basin Wildrye habitats of the Grasslands. We hope the USFS will take a position against this new project."

Response

The genetically altered bentgrass is outside of the limits for species considered for the seeding proposed in Alternatives C and D (FEIS, Chapter 2, Section 2.5.7). It is beyond the scope of this analysis to take a position regarding this topic.

Comment

"…have noted excessive degradation caused by rampant off road motorized vehicle abuse throughout the area. There is a serious need to rectify this ongoing problem…The DEIS needs to fully analyze this issue, and present effective management methods which address and rectify existing problems caused by off road vehicles."

Response

Off-highway vehicle (OHV) travel and access management falls outside of the purpose and need for this analysis (FEIS, Chapter 1, Section 1.4.2). This does not preclude the proposal and inclusion of OHV travel and access management projects in future analyses.

Comment

"We urge adoption of management that will benefit the entire watershed."

Response

Watershed effects are described in the FEIS, Chapter 3.

Comment

"I would like to hear your explanation of the difference of habitat on the refuge vs. the general grasslands."

Response

It is assumed that the "refuge" referred to is actually the Rimrock Springs Wildlife Management Area. This area was created and designated to, "Provide unique habitat (wetlands, ponds, springs) within the juniper-sagebrush steppe characteristic of central Oregon's high desert." and to "Improve present habitat conditions and promote habitat diversity" (p. 4-34, LRMP 1991). It is a human created wetland managed for wildlife habitat benefits and for wildlife viewing. Because riparian areas are highly productive, the grasses will generally grow taller and stay lush longer into the year, in contrast to the majority of the Grassland which is a high desert upland environment. Therefore Rimrock Springs habitats cannot be compared to the rest of the Grassland.

MONITORING

Comments

"The department has the following concerns…(2) current monitoring strategies may be insufficient to provide the information necessary for the effective use of adaptive management…"

"The Department recommends…(1) the implementation of an annual assessment of status and resulting trend over time for the restoration of shrub-steppe habitat, along with an effectiveness evaluation of restoration and management efforts…"

Response

A standard condition/trend monitoring requirement is added to the FEIS (Chapter 2, Section 2.4). Condition/trend clustered transects will be reread every five to ten years, providing budgets allow. Additional monitoring requirements pertaining to bitterbrush utilization are also included in the FEIS (Chapter 2, Section 2.4).

Comment

"The Department recommends…(2) the collaboration with the Bureau of Land Management, Oregon Department of Fish and Wildlife, Tribes, and the Service when developing the monitoring and evaluation program."

Response
The Ochoco National Forest and Crooked River National Grassland welcome any assistance that the BLM, USFWS, ODFW, Tribes, and State are willing to provide in evaluating the effectiveness of implementing the selected alternative, and in conducting the monitoring identified within the FEIS (Chapter 2, Section 2.4). Collaboration with these and other entities is ongoing and will continue into the future. In particular, implementation of the seeding trials and the monitoring and evaluation of the results will involve a variety of parties.

Comment

"The Department recommends that the FEIS include a monitoring section for livestock grazing to ensure that subsequent management practices (e.g., proposed AUM levels and/or management guidelines) are consistent with the project's desired recovery objective of vegetative conditions for the CRNG."

Response
The FEIS (Chapter 2, Section 2.4) includes monitoring requirements associated with livestock use, designed to ensure resource requirements are met. Two monitoring clauses have been added to the FEIS associated with measuring ecological condition and long term trends. One monitoring clause has been added to the FEIS associated with measuring annual livestock use of bitterbrush on those pastures in mule deer winter range.

Comment

"EPA recommends that a separate section on monitoring water quality, vegetation, and wildlife be added to the FEIS."

Response
Monitoring requirements are included in the FEIS, Chapter 2, Project Design Criteria and Monitoring Common to Alternatives B, C, and D (Section 2.4). These requirements are in addition to those outlined in Chapter 5 of the Land and Resource Management Plan.

Comment

"Grazing strategies appear to be well planned out. Monitoring however, is essential in order to adjust seasons and period of use."

Response
The FEIS, Chapter 2, Project Design Criteria and Monitoring Common to Action Alternatives B, C & D (Section 2.4), provides a listing of monitoring items.

NON-NATIVE INVASIVE PLANT SPECIES

Comments

"Because of the key role livestock play in the spread of weeds, areas where juniper has been removed should be rested from all livestock grazing--at the very least--until they have fully recovered to native species plant communities. (See, e.g., Belsky (1996), at 57)."

"Restoration is meaningless without the attendant prevention of factors that caused the problem in the first place. Prevention is separate from detection, response, and restoration, and is key to

developing a plan of action that will allow the permanent recovery of these public lands. Healthy areas and recovered areas should be managed to: (1) prevent their conversion to exotic weed-dominated communities, (2) prevent loss of biodiversity, (3) prevent unnatural changes in fire frequencies and intensities, and (4) prevent the unnatural conversion of grasslands to shrublands and of shrublands to woody thickets. The number one land use impacting the Forest Service's ability to recover these lands permanently, so that inevitable invasive plant species and juniper expansion are not simply temporarily delayed, is livestock grazing. Domestic livestock are probably the major cause of weed invasion in the arid West. See A. J. Belsky & J. L. Gelbard, *Livestock Grazing and Weed Invasions in the Arid West*, Oregon Natural Desert Association (2000)…

Restoration without prevention threatens to waste agency time and money. If management after restoration is not altered, the original problems will return. For example, if weeds have invaded an area because of disturbances to the soil by livestock, or if grasslands have been converted into shrublands because livestock had overgrazed the grasses necessary to carry fire between shrubs, then recovery activities will be a futile effort without the cessation of these activities. The weeds will simply re-invade and the shrubs and trees will return, no matter how much effort much effort and money was spent originally to restore these lands. Pinyon-juniper control in the Southwest in the 1950s and 1960s is a case in point. After large amounts of money were spent to remove the trees from grasslands, they simply reestablished themselves once the original management activities resumed following a short period of protection.

The Federal Register notice indicates that there is a "social/economic need" to continue livestock grazing on the CRNG, as well as a need to modify grazing practices because some current practices "discourage native grass and forb species establishment and maintenance." 68 Fed. Reg. at 8583."

"Disturbances to soils must be minimized. Disturbed soils act as natural seedbeds that are vulnerable to exotic plant invasions. A major cause of such disturbance is livestock trampling which disturbs the soil and microbiotic crusts. Livestock graze selectively on native species, leaving the less palatable, introduced weed species behind. They also weaken native plants by compacting soil, and enhance weed growth by creating nitrogen hotspots with their dung and urine. Livestock enhance weed growth in so many ways that it is difficult to prevent weed invasion and rapid weed growth in the presence of livestock. As indicated above, areas where soils have been disturbed (such as after juniper removal by mechanical means) should be closed to livestock grazing until native vegetation has been fully reestablished and the soils have been fully restabilized."

Response

The Belsky article cited (1996) in the first comment makes no connection between the spread of noxious weeds and livestock grazing, however, the article mentioned in the second comment, co-authored by Belsky, Livestock Grazing and Weed Invasions on the Arid West (2000), has this topic as its primarily focus. A review of this paper conducted on the Wallowa-Whitman National Forest (see analysis file at the Crooked River National Grassland office in Madras, Oregon) found that it appeared to contain many inconsistencies and even contradictions. As was found in the Wallowa-Whitman National Forest Review, noxious weed infestations on the Grassland appear to overwhelmingly correspond to roads (FEIS, Chapter 3, Section 3.13). This leads to the conclusion that the primary vector for noxious weed spread on the Grassland is vehicle traffic rather than livestock (which is the premise of the Belsky et.al. (2000) article).

Under NEPA, the USFS is required to disclose the effects of its proposed actions. Soils and weed disturbance discussions are found in the FEIS, Chapter 2, Table 2-11 Summary of Expected Effects by Alternative by Resource and Chapter 3, Soils Environmental Effects (Section 3.5.3). These sections document grazing and juniper control impacts to soils, microbiotic crusts, nutrient cycling and weeds (FEIS, Chapter 3 Section 3.13).

There are only 488 acres proposed to be treated by ground disturbing mechanical means (Appendix E Alternative C and D Vegetation Treatment Project Descriptions, label # 17 through 21). Design Criteria (FEIS, Chapter 2, Section 2.5.4) are also included to minimize the introduction and spread of noxious weeds.

Comment

"Because the proposal incorporates a goal of also restoring native plant species, any juniper removal must carefully consider the possibilities for exotic species invasions following tree removal. While juniper removal would be expected to increase the productivity of understory shrubs and herbaceous plants, this increase may include undesirable exotic weedy annuals and shrubs."

"The Department has the following concerns…(1) ground disturbing restoration actions such as tillage, prescribed fire, mechanical juniper removal, and livestock grazing may lead to an increase in density and distribution of noxious weeds."

"Habitat restoration should be accomplished using the least disturbing methodologies to minimize the risk of spreading invasive weed species. The Department recommends the FEIS include actions that minimize soil disturbance activities and the use of fertilizers. Additionally, in areas that retain a shrub component or productive bitterbrush, the Department recommends that juniper trees be removed by cutting rather than prescribed fire."

Response

The FEIS, Chapter 3, Non-native Invasive Plant Species section (Section 3.13) describes the effects of the alternatives. These effects are based upon the implementation of the project design criteria listed in the FEIS (Chapter 2, Section 2.5.4).

The scope and scale of the seeding in Alternatives C and D will restore shrub steppe conditions and improve wildlife habitat at a more desirable rate than using other less disturbing methodologies. The risk of spreading invasive weeds has been evaluated in the FEIS (Chapter 3, Section 3.13). In Alternatives C and D, islands of existing bitterbrush and big sage will be left because many of the treatment units only affect up to 1/3 to 3/4 of the area. As specified in the FEIS, Chapter 2, Project Design Criteria Common to Alternatives C and D (Section 2.5), there will be a series of field trials to evaluate some of the proposed seeding treatments.

Prescribed fire is one of many tools available for treating western juniper. Both Alternatives C and D of the FEIS incorporate the use of prescribed fire. However, there are many instances where the use of prescribed fire would not be ecologically appropriate, such as:
when undesirable understory species would be favored by fire (FEIS, Chapter 3, Section 3.13.3),
when retention of the understory shrub species is desired (FEIS, Chapter 1, Section 1.4),
when fuel loadings would result in detrimental soil conditions when burned, and
when fuels loadings would result in unmanageable fire behavior during suppression efforts.

Comment

"…permit the spraying of weeds as soon as a product becomes available that can be used to reduce the weed population on the grasslands."

Response

Spraying noxious weeds falls outside of the purpose and need for this analysis (FEIS, Chapter 1, Section 1.4.2). Some weed sites are being treated under the 1998 Integrated Weed Management

Plan. Although some new sites found since then are being treaded by manually pulling them, most are not being treated. The Forest and Grassland are currently conducting another noxious weed analysis and plan on making a decision in the Spring of 2005. The Proposed Action in this analysis includes the use of new chemicals that are more effective, and additional weed sites on the Grassland.

PRIORITIZATION

Comments

"The department has the following concerns…(3) a clearly articulated strategic approach and prioritization for shrub-steppe restoration was not identified within the DEIS."

"… the Department also recommends developing and implementing a collaborative, strategic approach to address and prioritize restoration actions and monitoring needs at the landscape level, and establishing a collaborative adaptive management process that includes interested and affected parties."

"The Department supports the spatial and temporal prioritization of restoration sites at the landscape scale to maximize available habitat quality and quantity for at-risk species and big game winter range, as has been discussed with the Forest Service, and recommends including this information in the FEIS. This prioritization will be essential to reaching habitat restoration goals because the actual number of juniper acres treated will vary from 0 to 3,000 acres per year due to budget and other constraints. The Department recommends that high priority be given to those sites that have the highest potential for successful shrub-steppe restoration."

Response

Initial prioritization of the FEIS proposed projects has been conducted and is documented in the Five Year Natural Fuels Strategy for the Ochoco National Forest and Crooked River National Grassland (located within the analysis file at the Madras office).

The Ochoco National Forest and Crooked River National Grassland wish to continue an open collaboration with our partners (USFWS, ODFW, Tribes, State, and local organizations) in scheduling and implementing restoration treatments. In particular, implementation of the seeding trials and the monitoring and evaluation of the results will involve a variety of parties.

RIPARIAN

Comments

"The DEIS does not contain plans to adequately address the restoration of these [303(d) listed] streams."

"The Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters, May 1999, highlights the U.S. Forest Service's (USFS's) and Bureau of Land Management's (BLM's) commitment to protecting and restoring the quality of public waters under their jurisdiction in Oregon. According to the protocol, the USFS and BLM plan to address impaired waters by: validating the 303(d) list and documenting when a stream is restored; documenting and implementing sufficiently stringent management issues; and developing and implementing Water Quality Restoration Plans (or documenting that current measures are sufficiently stringent to bring affected waters into compliance); or using other available mechanisms including changes in water quality standards."

Response
The Oregon Department of Environmental Quality's (ODEQ) target date for completion of Total Maximum Daily Loads (TMDLs) and Water Quality Management Plans (WQMPs) in the area encompassing the Crooked River National Grassland is 2006. The Forest Service is participating in this process and will continue to work collaboratively with watershed councils and the ODEQ to develop WQMPs. Therefore, no separate WQMP will be prepared in association with this FEIS. The 303(d) listed streams on the Grassland are not expected to be measurably affected by the management actions proposed in the four alternatives. No treatments would occur in designated Riparian Habitat Conservation Areas and almost all (over 90 percent) of the riparian areas on the Grassland have been fenced to exclude livestock grazing.

Comment

"The FEIS should describe the process that was used for placement of fencing and describe the portion [of] the floodplain contained within the fenced area. Excluding cattle from as much of the floodplain as possible will accelerate the natural recovery of the riparian areas."

Response
Over 90 percent of the Grassland riparian areas were fenced to exclude livestock grazing over ten years ago. Generally the strategy was to fence an area corresponding to the 100-year flood zone. However, in finding a solution that was workable with range permittee, the area fenced was usually less (personal communications with the Forest Wildlife Biologist, Dave Zalunardo)

Comments

"Future actions to restore the function of riparian areas as listed on page 203 in the DEIS are also essential to their rehabilitation. EPA recommends that these future actions be given a high priority in the management of the CRNG."

"Riparian areas should receive adequate attention. The reintroduction of passage for anadromous fish is now in the planning stage. Mud Springs, Willow Creek, and Lone Pine Flat were highlighted in the Watershed Assessment as candidates for hydro improvement projects. Willow plantings would be a start to building banks up. Further remediation may need to occur to restore hydrologic connectivity. Riparian areas should be a key focus for active project work in order to restore the Grassland closer to a historic site condition."

Response
The initiation of riparian projects falls outside of the purpose and need for this analysis (FEIS, Chapter 1, Section 1.4.2). This does not preclude the proposal and inclusion of riparian restoration projects in future analyses.

Comments

"EPA recommends that the FEIS contain a plan for minimizing road related impacts to water quality, fisheries and wildlife and that the USFS make funding and implementing this plan a high priority."

Response
Access and travel management falls outside of the purpose and need for this analysis (FEIS, Chapter 1, Section 1.4.2). This does not preclude the proposal and inclusion of access and travel management projects in future analyses.

SEEDING

Comment

"NPSO opposes the use of grass cultivars that were developed from genetic sources in other states or ecoregions."

Response
Forest Service policy is to use local native species for re-vegetation projects, if conditions are suitable for native species and seed is available. Cultivated varieties could otherwise be used. Loss of topsoil from decades of farming and the introduction of cheatgrass may have created conditions where some native species may be more difficult to establish than cultivars of native grasses. Cultivars have been shown to be adapted to disturbed sites and compete well with invasive plants.

Seeding trials would be conducted prior to implementation of large-scale seeding projects. A variety of treatments and seed mixes would be evaluated. If trials indicate native species can be successfully established, they would be preferred.

However, seed cost is a consideration. The National Grassland has completed seed collections of native grasses and forbs, and has contracted for production of two native grass species. Current contract price for locally collected, native bottlebrush squirreltail is $24/lb, whereas the cultivar, big bluegrass, is currently available for $1.15/lb. At present prices, this translates into seed costs of $30-$50/acre for a native/cultivar mix, and $70-$100/acre for a pure native seed mix. Funding may limit purchase of large amounts of native seed for range rehabilitation projects. However, as the market for native seed expands, price drops are anticipated. A minimum of five seeding trial plots will be seeded exclusively with native species.

Comments

"…many or all of the areas used as livestock pastures have fragile, thin soils unsuitable for grazing. This is especially evident on the allotments planned for tilling and reseeding. These shallow soils cannot be successfully plowed or deep-tilled, and any resultant planting of a monoculture grass for livestock forage would likely be unsuccessful."

"Tilling and plowing do accomplish eliminating vulnerable and rare native plants, and reducing the natural biodiversity of tilled areas, however such accomplishments are not in accord with the public trust responsibilities of managing a National Grassland."

"BMBP supports the goal to actively restore native species in areas of the CRNG that have been previously seeded to crested wheatgrass and other introduced forage species--however the methods of this restoration must be accomplished without the proposed plowing or tilling."

"There should be absolutely no tilling or plowing within the CRNG, and absolutely no planting of any exotic grasses or plants of any type, however reputedly temporary they may be.

Response
Tillage and seeding effects are addressed within Alternatives C and D (FEIS, Chapter 3).

Shallow soils (defined by the NRCS as soils less than 20 inches deep) comprise only a portion of the soils found on the CRNG. See Table 3-19 in Chapter 3 of the FEIS which displays the percentages and acreages of ash and shallow soils on the Grassland by watershed.

As stated in the FEIS (Chapter 2, Section 2.3.3) only those sites that were historically plowed fields and then seeded to crested/tall wheatgrass are proposed for re-seeding. The shallow, rocky soils known as lithosol, or "scabland," referred to by the commenter were not generally plowed or seeded in the past. These soils are relatively unchanged since settlement, and are therefore not proposed for treatments.

Most of the proposed tillage is to be completed with a large rangeland Towner type disc which would decompact soils to an approximate depth of eight to ten inches. Therefore shallow soils can be tilled if they are not too rocky. This disc action would prepare a seedbed and reduce competition from other species.

Most of the historically plowed and seeded areas have been colonized to varying degrees by native plants, especially Sandberg's bluegrass, sagebrush, rabbitbrush, and silvery lupine. As stated in the FEIS (Chapter 2, Section 2.3.3), approximately half of the treatment area would actually be seeded. Depending on the result of seeding trials, up to approximately 4,000 acres would actually be tilled (out of the 8,300 acres proposed). The objective is to create a mosaic of cover types, and increase the density of deep-rooted perennial grasses and forbs. Areas with greater plant diversity, such as groups of sagebrush or other areas that have higher degrees of colonization by natives, would not be tilled or seeded. In tilled areas, the existing native and non-native plants species are expected to persist, with additional establishment by the seeded species. Additional native plants from the unseeded areas are expected to colonize the seeded areas. The proposed species for planting would not create a monoculture by any means (FEIS, Chapter 2, Section 2.5). The proposed seed mixes will also benefit wildlife species such as mule deer and antelope.

Comments

"…, we strongly recommend that before plowing these sites, other methods of interseeding be tried. Alternatives to plowing may be cheaper, easier and present less risk to noxious weed invasion. Winter and spring moisture is essential for successful seeding. Years with sufficient moisture are limited. Alternatives to plowing could include interseeding, possibly with a pitter that opens pockets of bare soil where desirable seeds can be placed. The machine cuts through the root mass of Sandberg's bluegrass and seed could be placed into the newly opened sites. Grazing during period of high soil moisture could create safe sites for new seedling germination and establishment. Seeding in fall and broadcasting into the pits may be an alternative."

"We strongly recommend that before plowing these sites other methods of interseeding be tried."

"The proposed seeding on old crested wheatgrass sites should be accomplished with equipment or methods that can seed interstitially, as succession is occurring in most areas."

Response
Interseeding with and without fertilizer will be part of the proposed trial treatments (FEIS, Chapter 2, Section 2.5). As documented by Lee Eddleman of the Oregon State University, the moisture year (i.e., longer term forecasts of above normal precipitation in November and December) will be used to help choose the right year for initiating the seeding, tillage, and fertilizer trials.

A rangeland drill will be used to accomplish all seeding projects, which will help ensure seed germination and seedling establishment. Seeding with the rangeland drill has been shown to have a much higher probability of success than broadcast seeding, (except after some fires). This is especially important when using expensive native seed. Range pitters are not readily available in this area but would be considered for use if available.

A variety of site preparation methods will be considered during the seeding trials.

Comments

We would encourage you to utilize acres that are large enough to test the equipment and the proposed practice while covering quite a few soil types (ex 10- 40 acres).

"Before going forward with the pasture rehabilitation, you will establish trials. We were unable to locate within your document the recommended size of these trials. We would encourage you to utilize acres that are large enough to test the equipment and the proposed practice while covering a few different soil types (ex 40 acres)."

Response

The size of these trials is proposed to be a minimum of ten acres per treatment. This is contingent on the cost of the treatment equipment, proposed seed mix (especially expensive native seed) and the cost of fertilizer. These trials will be simple field trials looking at seeded plant establishment and cover over time, site production (lbs/acre), and noxious weed dynamics.

Comment

We also question the fertilizer recommendation. While the soil may have a deficiency in nitrogen, phosphorous, or potassium, the native perennial bunchgrasses are not able to respond immediately to the availability of nutrients being provided by fertilizer, as a consequence, the fertilizer will favor exotic annual grasses (as has been shown in previous studies).

"We also question the fertilizer recommendation. Soil may demonstrate a deficiency in nitrogen, phosphorous or potassium. Native perennial bunchgrasses are able to respond to the immediate availability of nutrients being provided by the fertilizer however, the fertilizer will favor exotic annual grasses."

Response

On formerly farmed and heavily grazed soils, fertilizer is often very beneficial and increases productivity. Evidence of this is found in increased bunchgrass productivity in the pipeline corridor on the CRNG which was decompacted, seeded, and fertilized (FEIS, Chapter 3, Soils, Alternatives C and D, Seeded Sites).

Weed prevention and control is a concern which has been addressed by requiring weed free seed and by requirements to clean tillage and seeding equipment (FEIS, Chapter 2, Section 2.5).

The fertilizer specified in the FEIS is a low nitrogen formulation compared to the high nitrogen levels used in the studies which found that fertilization favored weedy species. The recommended formulation also contains phosphorous, potassium and sulphur which aid in restoring site productivity. Monitoring would target seeded species establishment and invasive plant species occurrence. Trials will be utilized to determine the effectiveness of, and effects from, fertilization

(FEIS, Chapter 2, Section 2.5). The use of fertilizer will increase the relative rate of restoration change toward more productive historic conditions.

Comment

"The allotments planned for seeding and tilling should be vacated and permanently closed to livestock grazing due to heavy over-grazing damage and fragile, thin soils, as well as the presence of remaining rare native plants in some places."

Response

As the FEIS (Chapter 2, Section 2.3.3) indicates, the proposed tilling and seeding will be conducted on areas which have historically been plowed and seeded to non-native species. The FEIS (Chapter 3, Section 3.8.2) states that no proposed, endangered, or threatened plant species are documented or suspected of occurring in the geographic area that includes the Crooked River National Grassland and no habitat is present for these species. In addition, "[d]ue to the nature and degree that [the sites proposed for tilling and seeding] were altered as a result of past homesteading, farming, disking, and seeding, today, they no longer provide habitat for sensitive plant species." The FEIS (Chapter 3, Soils, Seeded Sites) indicates that tillage and seeding is a measure designed for soil restoration, particularly the amelioration of compaction. Seeded areas will be rested for a minimum of two years (Chapter 2, Section 2.5). None of the areas proposed for seeding indicate downward trends associated with livestock grazing (FEIS, Chapter 3, Section 3.3.2).

Comment

"…put more emphasis on seeding and fertilizing more acres to re-establish grass and better control weeds and erosion."

Response

Seeding and fertilizing are actions included under Alternatives C and D (FEIS, Chapter 2, Section 2.3).

SENSITIVE PLANTS

Comment

“NPSO requests further consideration of rare and sensitive plant species … for Peck’s Penstemon and Este’s wormwood.”

Response

In 2003, sensitive plant surveys were completed on a variety of locations within the National Grassland, when the first Grassland occurrences of Peck’s penstemon were documented. However, funding did not allow survey of all potential habitat for sensitive plant species. Both of these species are associated with riparian areas. Since over 90% of the riparian areas are fenced, and there are no vegetation activities proposed within riparian areas in both Alternatives C and D, all alternatives are expected to result in continued viability of this sensitive plant species (FEIS, Chapter 3, Section 3.8).

SOILS

Comment

[The DEIS for the proposed CRNG management fails to disclose or incorporate current research regarding the need to assess microbiotic crusts and cryptographic soils in order to accurately and fully disclose rangeland health, as well as incremental, impacts of livestock grazing. Among the studies not adequately incorporated into this NEPA document are: "*Monitoring Rangeland Health Using A Biological Soil Crust Stability Index"* by Roger Rosentreter and David J. Eldridge, USDA FS Proceedings, RMRS-P-000.2003; "*Key to Soil Lichens of Central and Eastern Oregon*" by Bruce McCune and Roger Rosentreter, August 14th, 2001; and "*Recovery of Biotic Soil Crusts Following Wildfire in Idaho*" by Julie H. Hilty et al, Journal of Range Management 57:89-96, January 2004...The DEIS needs to be corrected and revised to fully analyze , disclose and incorporate this pertinent scientific--including agency--research as required by NEPA. Proposed alternatives need to be significantly revised to prevent the known and likely harms to cryptogrammic soils, microbiotic crusts, and the moss and lichen communities which together comprise the basis for soil and grassland community health. ... The agency needs to adopt, analyze, and disclose monitoring methods which utilize the recommended biological soil and/or crust stability index as applied to the CRNG in assessing current rangeland health and the likely impacts, including cumulative impacts, of its proposed management actions.]

Response

The NRCS 2001 Ecological Write-up Inventory did assess ground cover of soil crusts. However, the document *Monitoring Rangeland Health Using A Biological Soil Crust Stability Index* also provides a very good protocol for collecting and assessing soil crust data. This protocol may be incorporated into future inventory methodologies used on the Grassland. The *Key to Soil Lichens of Central and Eastern* Oregon would be of utility in collecting this kind of data also. A review of *Recovery of Biotic Soil Crusts Following Wildfire in Idaho* indicates that the activities which are beneficial to biotic crust recovery are consistent with the management strategies of seeding and incorporation of rest pastures included in Alternatives C and D (FEIS, Chapter 2, Section 2.3). Interpretation of soil crust data must take into account the homesteading history of the Grassland. Up to half of the land area was actively farmed and the remainder was heavily grazed until the mid- to late-1930s.

WATER QUALITY

Comment

"Because watershed restoration is also a key component of this proposal, the CRNG should pay particular attention to the main causes of watershed degradation, especially grazing practices. The numerous ways livestock have damaged the morphology, geology, and ecology of streams are complex and interconnected. (*1 See Belsky 1999).* Because livestock are basically riparian species, they spend much of their time in streams in warm weather and on stream banks in cooler weather, intensifying their damage to wet ecosystems. The effectiveness of the elimination of livestock is evident inside every *effective* riparian exclosure in the West. Because the soil is moist, riparian exclosures are nearly immediately colonized by hydric and mesic species, stream bottoms begin to decrease in depth, stream bank incisions and morphology begin to recover towards normality, and water quality and quantity improve. Although the studies discussed in Belsky et al. (1999) often lack adequate replication and statistical design, the replication represented by plant regrowth and hydrological changes in literally hundreds of exclosures throughout the United States gives power to the data."

Response
On the Grassland, livestock are fenced out of over 90 percent of the riparian areas except where water gaps were established (FEIS, Chapter 3, Section 3.6).

Comment
"With respect to water quality, there should be no further degradation or harms to all of the 303(d) listed streams in the affected watersheds, and the reasons for listing, e.g.: the primary causes for not meeting water quality standards, must be addressed, disclosed and alternative actions proposed which will be capable of successfully rectifying these causes. As such, the DEIS needs to be revised: there should be no management actions proposed which fail to fully address these problems and which will result in further continued violations of water quality standards."

Response
The FEIS states in Chapter 1, Management Direction, Legal Status for Management, Clean Water Act: "Section 209 (Basin Planning) requires regulation of non-point sources of pollution using water quality management plans and basin planning. The use of Best Management Practices (BMPs) is the backbone of the regulatory program for non-point source control. Stubble height in pastures is closely monitored and used as a surrogate for hydraulic roughness. If minimum stubble heights are being met then it is assumed that there is sufficient roughness to trap sediment that is mobilized during periods of surface runoff."

The FEIS, (Chapter 3, Section 3.6.2) lists what the hydrologic attributes (water temperature, sediment, etc.) each stream is listed for. The discussion under each watershed makes it clear as to the likely factors (homesteading, farming, past livestock use, etc.) behind the listing. The majority of perennial and larger intermittent streams are now fenced, and have been for a minimum of ten years, from livestock use, thereby precluding grazing impacts. . Fencing excludes cattle and provides a vegetative buffer to trap any sediment that would escape a treatment unit or pasture. Water temperature monitoring is being accomplished on both Willow and Squaw Creeks. The FEIS does not propose actions that will violate water quality standards and/or measurably affect water quality.

Comment

"The FEIS should discuss in more detail the activities adversely impacting water quality on the CRNG and discuss a plan for reducing the impacts."

Response
The FEIS is modified to expand the discussion of water quality effects. The impacts to aquatic species and water quality are included for each alternative in the FEIS, Chapter 3, Fisheries and Hydrology. Project design criteria are included in the FEIS to minimize adverse effects to water quality (Chapter 2, Section 2.5) primarily utilizing buffers between activities and Class I, II and III streams.

The Oregon Department of Environmental Quality's (ODEQ) target date for completion of Total Maximum Daily Loads (TMDLs) and Water Quality Management Plans (WQMPs) in the area encompassing the Crooked River National Grassland is 2006. The Forest Service is participating in this process and will continue to work collaboratively with watershed councils and the ODEQ to develop WQMPs. Therefore, no separate WQMP will be prepared in association with this FEIS. The 303(d) listed streams on the Grassland are not expected to be measurably affected by the management actions proposed in the four alternatives. No treatments would occur in designated Riparian Habitat Conservation Areas and almost all (90 percent) of the riparian areas on the Grassland have been fenced to exclude livestock grazing.

Comment

"…, we are concerned about the impacts to water quality from activities proposed in the DEIS, specifically erosion caused by prescribed burning and tilling of soils. These actions should contain Best Management Practices (BMPs) that minimize sediment loading to streams and ensure that heat load is not increased in streams listed as impaired for temperature."

Response

Effects of prescribed burning and tilling of soils on fisheries and hydrology are described in the FEIS, Chapter 3, Proposed, Threatened, Endangered, and Sensitive Species and also in Fisheries and Hydrology. It states in Alternatives C and D that these activities would increase grass and shrub ground cover which would increase filtering vegetation and reduce sedimentation reaching streams. Tilling would have no measurable effect to streams or aquatic species, as PACHFISH/INFISH buffers would be included for Class I, II, and III streams (FEIS, Chapter 2, Section 2.5).

Comment

"The Final Environmental Impact Statement (FEIS) should identify the fish species affected by water temperature impairment for rearing and spawning."

Response

Temperature is discussed by watershed in the FEIS, Chapter 3, Fisheries and Hydrology. Fish species that would be affected by these temperatures are discussed by alternative by watershed in Chapter 3, Proposed, Threatened, Endangered, and Sensitive Species.

WILDLIFE

Comment

"Page 190, Table 3-51: In the review of the DEIS, the Department did not find the rationale for the determinations listed on this table. The rationale for each determination should be provided in the FEIS."

Response

The discussion of the rational for the determinations in Table 3-51 has been expanded in the FEIS and is outlined in detail in the *Resource Report and Biological Evaluation for Aquatic Species, which* is on file at the Grassland office in Madras.

Comment

"Page 198, First paragraph: The Department does not believe that Belding's ground squirrel, which occupies E1g (grass) dominated areas can be appropriately used as a surrogate when describing effects for the greater sage grouse, which occupies E1s (shrub) dominated seral/structural stages."

Response

The greater sage grouse effects section is rewritten is the FEIS without using the Belding's ground squirrel references. The pygmy rabbit effects section is also changed to reference the greater sage grouse instead of the Belding's ground squirrel.

Comment

"Page 198, Third paragraph last two sentences: It is clear that open strutting grounds are not a limiting factor within the CRNG or within the current distribution within Central Oregon. The paragraph should be removed or modified to address the limiting factors important to the greater sage grouse within the CRNG."

Response

This paragraph is modified in the FEIS.

Comment

"DEIS … also identifies the need to construct 15 miles of new three-wire fence. Any fence has the potential to impact wildlife movement or entangle wildlife, which further provides rationale why a forage reserve is questionable."

Response

Effects to wildlife from additional fencing were analyzed but not adequately discussed in the draft EIS. They are incorporated into the FEIS.

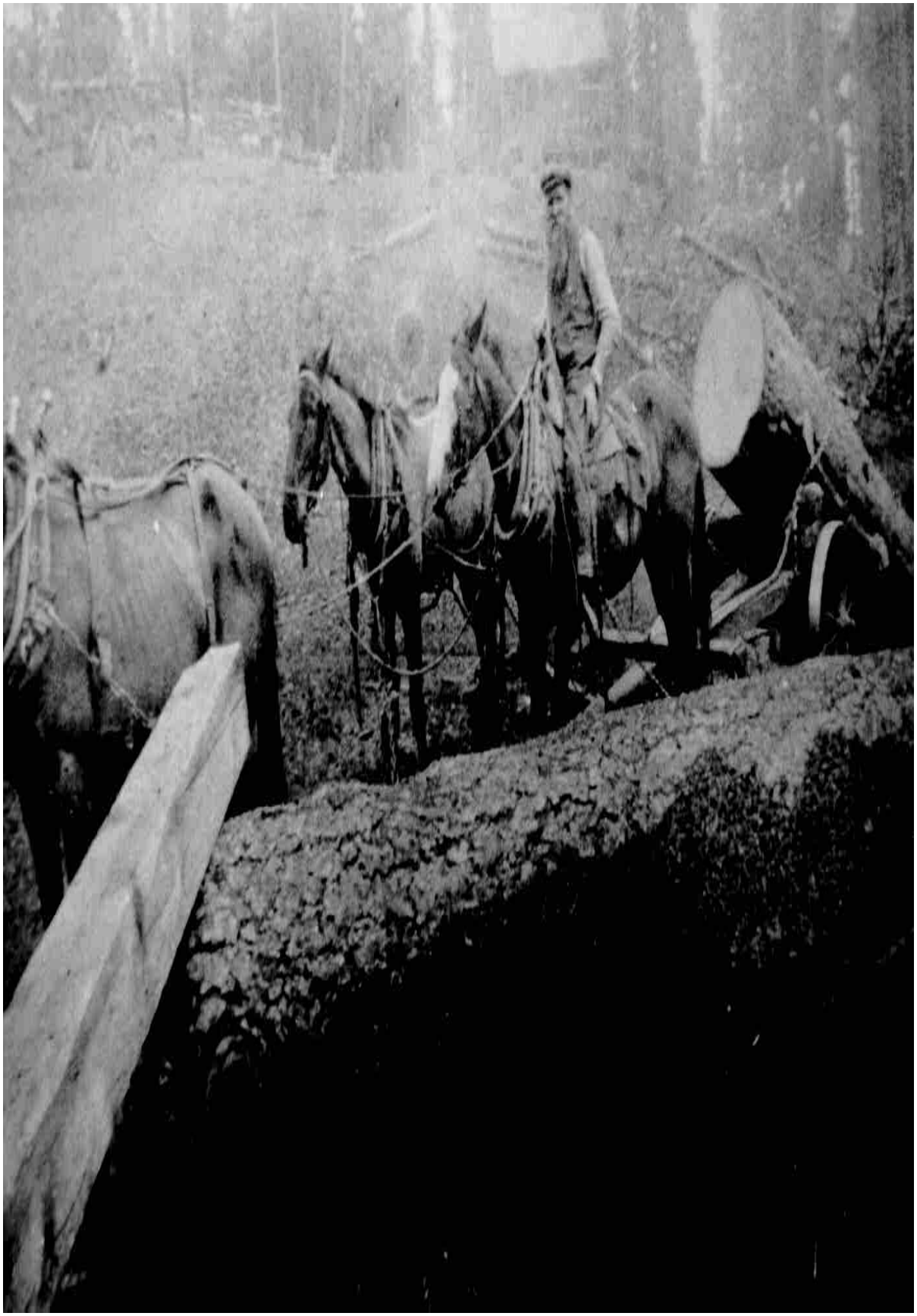
Comment

"ODFW supports Alternative C … with the following modifications:
Mud Springs Pasture boundary fence - ODFW supports the boundary change as long as the riparian exclosure fence is retained, maintained, and coupled with a grazing strategy designed to enhance habitat for mountain quail."

Response

Under all alternatives, the Mud Springs riparian exclosure fence will be retained and maintained. Under Alternatives C and D, the grazing system on the Fox/Dump Allotment changes to a rest rotation from deferred rotation which should benefit all ground nesting birds, including the mountain quail (FEIS, Chapter 2, Sections 2.3.3 and 2.3.4, and Chapter 3, Section 3.7.2).

Appendix Y List of Ongoing and Reasonably Foreseeable Future Actions



Ongoing and Reasonably Foreseeable Future Actions

Cumulative effects are assessed from the consideration of past, present, and reasonably foreseeable future actions. Present and reasonably foreseeable activities include:

- Grizzly Butte juniper density reduction project would be implemented.
- Suppression of wildfire during fire season would continue.
- Expansion and rehabilitation of the Round Butte material site is expected.
- Recreation use, including recreational driving, dispersed camping, horseback riding, hiking, mountain biking, ATV use, and hunting would continue.
- Road maintenance and road de-commissioning is expected to continue. Road maintenance (e.g. road grading, re-paving of highway 26) would occur periodically. Specific road de-commissioning actions have not been analyzed.
- Deschutes Valley Water municipal water line, to serve the city of Madras, would be constructed on the northwest portion of the CRNG.
- Noxious weed control would continue under the 1998 Ochoco National Forest and Crooked River National Grassland Integrated Weed Management Plan.
- Permitted recreation events, including field dog trials and the Ridge Rider endurance horse riding event, is expected to continue.
- Various natural fuels reduction projects, including burning in Skull Hollow and other smaller projects.
- Skull Hollow fence and water source re-location.
- Installation and maintenance of fences associated with springs and wildlife guzzlers would continue.
- Maintenance of utilities, including powerlines, pipelines, and communication facilities would continue
- Development of the Blanchard Well is anticipated
- Mineral material sources would continue to provide material for road maintenance, Jefferson County and Oregon Department of Transportation.
- Various wildlife projects, such as repair of Carcass Canyon Pond, would occur.
- Stream and riparian enhancement projects, such as placement of large woody material, is anticipated. Planting of native hardwoods, such as *Populus tremuloides* Michx. [aspen] in riparian areas, and other hardwood enhancement projects (e.g. fencing) is anticipated.
- Other activities - This includes firewood cutting, root gathering by Native American Tribes, etc.

Appendix Z Cultural Resource Treatment Plan

CULTURAL RESOURCES

PROPOSED TREATMENT PLAN FOR A NO EFFECT DETERMINATION

Prepared for the

CROOKED RIVER NATIONAL GRASSLAND RANGE EIS

November 13, 2003

Crooked River National Grassland
Ochoco National Forest
By
Christine Lipscomb, COHG Archaeologist

The purpose of this Treatment Plan is to render a finding of No Effect under the 1995/2002 Programmatic Agreement between the Crooked River National Grassland (CRNG)/Ochoco National Forest, Oregon State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation regarding land management activities of the Crooked River National Grassland for the Range EIS Project. This Plan provides a coordinated program to avoid, any adverse effects to significant cultural properties during management activities identified in the Range EIS Project.

The Range Department on the CRNG has proposed improvements within the Crooked River National Grassland. There are multiple activities involved with this undertaking, i.e. seeding (which would include tilling/discing to a maximum depth of 4-8 inches (10-20cm)), prescribe burning, fence construction and improvements, stock pond maintenance and improvements and water trough and water pipe replacement. During analysis for the project, an appropriate search of background data was conducted. Project units were designed to avoid known eligible and potentially eligible cultural properties.

The potential for the most impact to unknown prehistoric cultural properties would be areas where there was no homesteading and affiliated activities, such as plowing, seeding or disturbances from high concentrations of cattle. The potential for the most impact to unknown historic cultural properties would be in areas that are identified for prescribed burning. During seeding implementation unknown historic cultural properties are automatically avoided. In order for seeding equipment to function historic sites are avoided.

Homestead activities such as plowing and discing have impacted known and unknown prehistoric cultural properties. The proposed seeding and burning projects would further disturb this unknown element. The known sites would be avoided by project redesign and the unknown sites will be avoided if found during project implementation. A verbal agreement between SHPO and CRNG in August 2003 was reached stating that since the previously seeded areas had previous ground disturbance and would have impacted unknown sites, that only 20% of the these areas needed to be surveyed before project implementation. If and when these project activities are implemented, the mitigations stated below must be met prior to implementation:

(1) All high probability areas, areas that have the potential for cultural properties, located in undisturbed areas and currently within seeding and prescribed fire treatment units, not previously surveyed for cultural properties, will be surveyed;

(2) 20% of the 8,100 acre high probability areas located within previously seeded areas and currently within seeding and prescribed fire treatment units, not previously surveyed for cultural properties, will be surveyed; within the remaining 80%, any unknown sites found during project implementation would be avoided. The activity will cease in the vicinity of the cultural property and the CRNG archaeologist will be notified.

(3) Newly discovered sites would be assumed “eligible” and would be reported to the Crooked River National Grassland management agency. Project activities would be stopped in the vicinity of the discovery until archaeologists have documented the site, evaluated its significance, and assessed potential project effects on significant components of the site.

(4) Known cultural properties, eligible and potentially eligible for the National Register of Historic Properties (NRHP) and located within seeding and prescribed burn treatment units will be protected by avoidance. These sites will be revisited, updated and flagged for avoidance. Unknown historic homesteads identified in historic records will be visited and recorded if needed. These will be flagged for avoidance.

(5) Management activities, such as new improvements, maintenance on existing features, (i.e. fences, stock ponds, etc…), seeding, burning and juniper control treatments, would be reviewed by an archaeologist.

(6) All cultural resource management reports resulting from the inventory, mitigations and discovery of new cultural properties during project implementation will be provided to the SHPO, and the CRNG through the section 106 process.

The 1995/2002 Programmatic Agreement among the United States Department of Agriculture, Forest Service, the Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation (ACHP) and the Oregon State Historic Preservation Office (OSHPO) Regarding Cultural Resource Management on National Forests in the State of Oregon, has streamlined procedures. For those undertakings identified in Appendices A and B, and the Non-undertaking category designed to comply with Section 106 of the National Historic Preservation Act, are excluded from case-by-case review because they have little or no potential to effect cultural properties. Under Appendices A and B, a determination by an archaeologist may require inspection or monitoring of the undertaking.

Some of these procedures are directly related to range improvements. They include:

(1) Appendix A – fence construction and maintenance that does not require blading of the fence line and/or the use of heavy equipment;
(2) Appendix B – construction of corrals and other fence structures that lead to the concentration of livestock in a confined area, and range improvements or maintenance (e.g., above ground pipelines and reservoirs);
(3) Non-undertakings – replacement of non-historic watering troughs that are installed in the same location.
(4) Project activities which are entirely within areas previously surveyed for cultural resources where no cultural resources were identified, if the previous survey was completed in accordance with the specifications and standards listed in this PA.
(5) Landscape scale low-intensity under burning where fire sensitive historic properties are absent and existing fire lines or existing roads or natural barriers will be used as fire lines.

Appendix AA Ecological Site Write-up Descriptions

Write-Up Number (Ref)	Latitude	Longitude	Elev.	Land Use	Ecological Site Name	Ecological Site Number	USFS Plant Asociation	Range Similarity Index	Annual Production Lbs/Ac/Yr	Percent Useable Forage	Annual Stocking Rate
A01	N44 25 83.0	W121 03 24.0	3650.0	Native	JD North 12-16"	**010XB070OR**	CJS2-32	82.6	1467.2	85%	0.39
A02	N44 27 00.7	W121 00 32.8	3448.0	Native	Shallow South 10-14"	**008XY210OR**	SD91-31	7.7	256.7	70%	0.06
A03	N44 25 57.2	W121 04 15.4	3613.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-26	35.1	1195.6	85%	0.32
A04	N44 24 05.6	W121 04 00.2	3179.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	25.8	443.3	80%	0.11
A05	N 44-25-34.2	W 120-59-56.0	3497.0	Native	JD Clayey 12-16"	**010XB027OR**	CJS2-26	21.9	1100.1	75%	0.26
A06	N44 25 42.2	W121 00 22.0	3411.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-26	27.5	627.9	85%	0.17
A07	N 44-25-21.9	W 121-00-39.3	3303.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	45.5	570.8	87%	0.16
A08	N 44-25-24.4	W 121-00-28.3	3351.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-91	28.4	1420.1	85%	0.38
A09	N 44-25-34.6	W 121-01-23.9	3267.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	23.6	1247.7	90%	0.36
A10	N44 25 44.6	W121 06 44.2	3947.0	Native	JD Clayey 12-16"	**010XB027OR**	CJS2-26	30.4	539.6	88%	0.15
A11	N 44 24 57.9	W 121 06 55.8	4031.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-12	45.6	706.9	82%	0.18
A12	N 44 26 52.6	W 121 05 16.1	3456.0	Seeded	JD Clayey 12-16"	**010XB027OR**	CJS2-26	23.5	1026.7	90%	0.29
A13	N 44 25 53.4	W 121 06 35.9	3969.0	Native	South 10-12"	**010XA007OR**	CJS2-26	77.8	1332.3	80%	0.34
A14	N 44 23 39.2	W121 06 45.2	3328.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-26	50.6	982.3	85%	0.26
A15	N 44 24 08.2	W 121 03 54.8	3142.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	61.3	818.0	88%	0.23
A16	N 44 24 33.4	W 121 02 34.8	3180.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-26	46.0	622.6	90%	0.18
A17	N 44 23 44.6	W 121 04 02.8	3012.0	Seeded	JD Sandy Loam 9-12"	**010XB025OR**	CJS2-91	9.1	711.3	60%	0.14
A18	N 44 25 23.2	W 121 08 51.1	3068.0	Seeded	Pumice North 10-12"	**010XA026OR**	CJS2-91	22.9	333.7	80%	0.09

Write-Up Number (Ref)	Latitude	Longitude	Elev.	Land Use	Ecological Site Name	Ecological Site Number	USFS Plant Asociation	Range Similarity Index	Annual Production Lbs/Ac/Yr	Percent Useable Forage	Annual Stocking Rate
A19	N 44 26 46.7	W 121 08 31.1	3231.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	23.4	724.7	80%	0.18
A20	N 44 27 41.8	W121 06 14.8	3224.0	Native	Droughty 8-12"	**010XA019OR**	CJS2-26	79.9	830.4	90%	0.24
A21	N 44 26 26.8	W121 05 32.0	3685.0	Native	JD North 12-16"	**010XB070OR**	CJS2-26	25.8	595.2	95%	0.18
A22	N 44 27 41.3	W121 04 28.2	3251.0	Seeded	Droughty 8-12"	**010XA019OR**	CJS2-92	65.7	929.1	90%	0.26
A23	N 44 32 30.4	W121 06 13.2	2881.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	38.2	606.1	90%	0.17
A24	N 44 32 12.2	W 121 06 16.8	2900.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-91	10.5	293.3	85%	0.08
A25	N 44 27 51.4	W 121 13 09.1	2978.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	17.5	538.6	47%	0.07
A26	N44 30 45.5	W121 5 41.2	3061.0	Seeded	Shallow North 10-12"	**010XA025OR**	CJS2-91	12.0	398.9	60%	0.08
A27	N 44 29 36.0	W121 03 46.2	3210.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	55.9	819.4	80%	0.21
A28	N 44 29 31.2	W121 04 19.7	3209.0	Seeded	Shallow South 10-14"	**008XY210OR**	CJS2-26	53.1	658.1	90%	0.19
A29	N 44 35 59.3	W121 06 05.5	2453.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	22.4	493.7	80%	0.12
A30	N 44 35 56.2	W121 05 43.7	2473.0	Native	South 10-12"	**010XA007OR**	CJS2-26	61.1	656.9	90%	0.19
A31	N 44 33 10.1	W121 05 12.0	2757.0	Native	Droughty 8-12"	**010XA019OR**	CJS2-26	32.0	976.2	85%	0.26
A32	N 44 33 11.9	W121 04 33.0	2797.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	18.7	899.6	90%	0.26
A33	N 44 34 06.3	W121 03 07.8	2896.0	Native	South 10-12"	**010XA007OR**	CJS2-91	22.2	1343.3	90%	0.38
A34	N 44 34 24.1	W121 02 50.2	2942.0	Seeded	Pumice Hills 8-10"	**010XA002OR**	CJS2-92	15.9	590.4	85%	0.16
A35	N 44 35 19.7	W121 02 43.2	2926.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-92	20.6	434.7	85%	0.12
A36	N 44 35 23.3	W121 02 16.6	2967.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-26	15.4	195.7	70%	0.04

Write-Up Number (Ref)	Latitude	Longitude	Elev.	Land Use	Ecological Site Name	Ecological Site Number	USFS Plant Asociation	Range Similarity Index	Annual Production Lbs/Ac/Yr	Percent Useable Forage	Annual Stocking Rate
A37	N44 36 08.2	W121 03 34.4	2818.0	Native	JD North 12-16"	**010XB070OR**	CJS2-26	21.3	265.4	80%	0.07
A38	N 44 36 05.3	W121 03 38.1	2885.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	35.5	500.2	75%	0.12
A39	N 44 36 28.4	W121 03 43.1	2751.0	Native	Droughty South 9-12"	**010XB042OR**	CJS2-13	11.6	113.7	85%	0.03
A40	N44 38 39.3	W121 01 01.5	2796.0	Native	Very Shalow Loam 10-14"	**008XY150OR**	SD91-31	66.7	384.8	45%	0.05
A41	N 44 38 45.6	W121 02 49.4	2808.0	Native	South 10-12"	**010XA007OR**	CJS2-26	56.1	483.7	80%	0.12
A42	N 44 28 45.1	W121 20 02.5	2583.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	56.2	754.3	95%	0.23
A43	N 44 29 01.7	W121 21 07.8	2707.0	Native	Loamy 10-12"	**010XA018OR**	CJSB-11	55.6	636.3	90%	0.18
A44	N44 27 40.8	W121 23 32.3	2877.0	Native	Very Shalow Loam 10-14"	**008XY150OR**	CJSB-11	21.7	831.0	85%	0.22
A45	N44 32 43.4	W121 19 17.6	2822.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	56.8	832.1	95%	0.25
A46	N 44 32 16.6	W121 18 02.6	2457.0	Native	Droughty South 9-12"	**010XB042OR**	CJS2-13	53.5	653.4	90%	0.19
A47	N 44 29 34.1	W121 24 09.1	2934.0	Seeded	Juniper-Pine-Fescue	**006XB002OR**	CPS2-11	62.8	1875.0	85%	0.50
A48	N44 25 34.6	W121 23 1.7	2471.0	Native	Droughty Loam 8-10"	**010XA001OR**	CPS2-11	20.7	711.1	45%	0.10
A49	N44 24 17.4	W121 18 09.5	2599.0	Native	Sandy North 10-12"	**010XA083OR**	CJS2-12	66.5	722.6	80%	0.18
A50	N 44 26 11.9	W121 25 50.9	2972.0	Native	Juniper-Pine-Fescue	**006XB002OR**	CPS2-11	40.4	690.3	80%	0.17
B01	N44-25-36.24	W121-3-33.36	4134.0	Native	JD Shrubby Mtn. North 12-16"	**010XB071OR**	CPS2-11	99.0	3111.3	75%	0.74
B02	N45 25 58.1	W121 02 13.0	3256.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	23.5	647.7	68%	0.14
B03	N44 25 23.5	W120 59 47.5	3492.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-26	65.1	864.3	66%	0.18
B04	N44 26 49.6	W121 00 7.3	3479.0	Seeded	JD Clayey 12-16"	**010XB027OR**	CSJ2-91	9.6	980.0	62%	0.19

Write-Up Number (Ref)	Latitude	Longitude	Elev.	Land Use	Ecological Site Name	Ecological Site Number	USFS Plant Asociation	Range Similarity Index	Annual Production Lbs/Ac/Yr	Percent Useable Forage	Annual Stocking Rate
B05	N44 28 00.4	W121 00 03.3	3436.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	53.6	881.5	85%	0.24
B06	N44 28 41.1	W121 01 00.2	3502.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-92	24.3	1190.9	72%	0.27
B07	N44 23 29.6	W120 59 25.7	3502.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-31	35.0	378.3	89%	0.11
B08	N44 24 19.6	W120 59 55.6	3425.0	Native	JD Clayey 12-16"	**010XB027OR**	CJS2-12	33.8	508.6	69%	0.11
B09	N44 24 23.7	W120 59 57.7	3374.0	Seeded	Pumice Hills 8-10"	**010XA002OR**	CJS2-26	25.8	758.4	59%	0.14
B10	N44 23 49.4	W121 00 52.3	3425.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-13	36.0	628.2	81%	0.16
B11	N44 23 56.3	W121 01 47.3	3675.0	Native	Very Shalow Loam 10-14"	**008XY150OR**	SD91-31	65.1	250.7	63%	0.05
B12	N44 24 14.6	W121 01 15.8	3619.0	Native	JD North 12-16"	**010XB070OR**	CJS2-32	39.5	769.9	83%	0.20
B13	N44 24 36.5	W121 01 57.5	3052.0	Seeded	Droughty 8-12"	**010XA019OR**	CJS2-91	25.2	862.9	64%	0.17
B14	N44 23 35	W121 02 05.4	3095.0	Native	JD Clayey South 12-16"	**010XB045OR**	CJS2-26	20.0	487.7	71%	0.11
B15	N44 25 51.9	W121 13 6.0	2836.0	Seeded	Pumice Flat 10-12"	**010XA009OR**	CJS2-91	11.0	620.9	70%	0.14
B16	N44 25 46.7	W121 13 12.9	2810.0	Native	Pumice Flat 10-12"	**010XA009OR**	CJS2-26	13.7	215.7	56%	0.04
B17	N44 28 30.0	W121 13 20.1	3380.0	Native	South 10-12"	**010XA007OR**	CJS2-13	69.3	575.9	86%	0.16
B18	N44 28 36.0	W121 13 33.4	3452.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-12	28.8	349.4	77%	0.09
B19	N44 28 13.3	W121 13 0.0	3290.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	16.7	268.0	50%	0.04
B20	N44 30 44.5	W121 06 11.7	3049.0	Seeded	Droughty South 9-12"	**010XB042OR**	CJS2-13	84.5	1563.6	66%	0.33
B21	N44 32 0.2	W121 05 2.8	3023.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	60.1	978.0	77%	0.24
B22	N44 771 42.3	W121 01 27.1	3332.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	56.4	824.2	85%	0.22

Write-Up Number (Ref)		Longitude	Elev.	Land Use		Ecological Number	Plant Asociation	Range Similarity Index	Annual Production	Percent Forage	Stocking Rate
B23	N44 32 14.8	W120 59 59.0	3450.0	Seeded	JD Clayey 12-16"	**010XB027OR**	CJS2-92	52.6	1305.3	69%	0.29
B24	N44 32 19.3	W121 02 10.4	3423.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-26	96.9	2089.0	92%	0.61
B25	N44 32 52.4	W121 02 22.0	3303.0	Native	South 10-12"	**010XA007OR**	CJS2-26	57.4	533.9	81%	0.14
B26	N 44 33 16.6	W 121 2 22.3	3101.0	Native	Sandy North 10-12"	**010XA083OR**	CJS2-26	23.6	299.7	69%	0.07
B27	N44 34 0.8	W121 02 2.2	3213.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-26	31.5	309.0	50%	0.05
B28	N44 34 07.2	W121 02 00.2	3185.0	Native	Droughty South 9-12"	**010XB042OR**	CJS2-26	32.7	329.0	76%	0.08
B29	N44 32 43.0	W121 01 8.4	3501.0	Native	South 10-12"	**010XA007OR**	CJS2-26	23.3	252.2	61%	0.05
B30	N44 35 9.1	W121 01 35.9	3159.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-26	34.5	349.9	60%	0.07
B31	N44 36 2.8	W121 01 39.5	2937.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-26	71.0	906.3	75%	0.22
B32	N44 36 4.5	W121 01 11.3	3190.0	Native	JD Clayey 12-16"	**010XB027OR**	CJS2-26	63.0	1116.3	85%	0.30
B33	N44 36 15.0	W121 02 05.5	2781.0	Native	Gumbo 9-12"	**010XB019OR**	CJS2-26	1.2	334.4	5%	0.01
B34	N44 36 37.8	W121 02 54.2	3129.0	Native	JD North 12-16"	**010XB070OR**	CJS2-12	46.7	1025.3	90%	0.29
B35	N44 36 30.6	W121 02 52.4	3088.0	Native	JD Clayey South 12-16"	**010XB045OR**	CJS2-13	83.6	1003.2	92%	0.29
B36	N44 32 17.2	W121 16 19.8	2565.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	70.9	1039.1	64%	0.21
B37	N44 29 27.1	W121 18 30.5	2799.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-26	27.7	560.1	76%	0.13
B38	N44 30 30.1	W121 17 20.0	2673.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	18.7	339.0	62%	0.07
B39	N44 26 30.9	W121 22 16.7	2814.0	Native	Loamy 10-12"	**010XA018OR**	CJS2-26	42.6	428.8	79%	0.11
B40	N44 26 44.3	W121 22 13.7	2776.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-32	50.5	592.4	66%	0.12

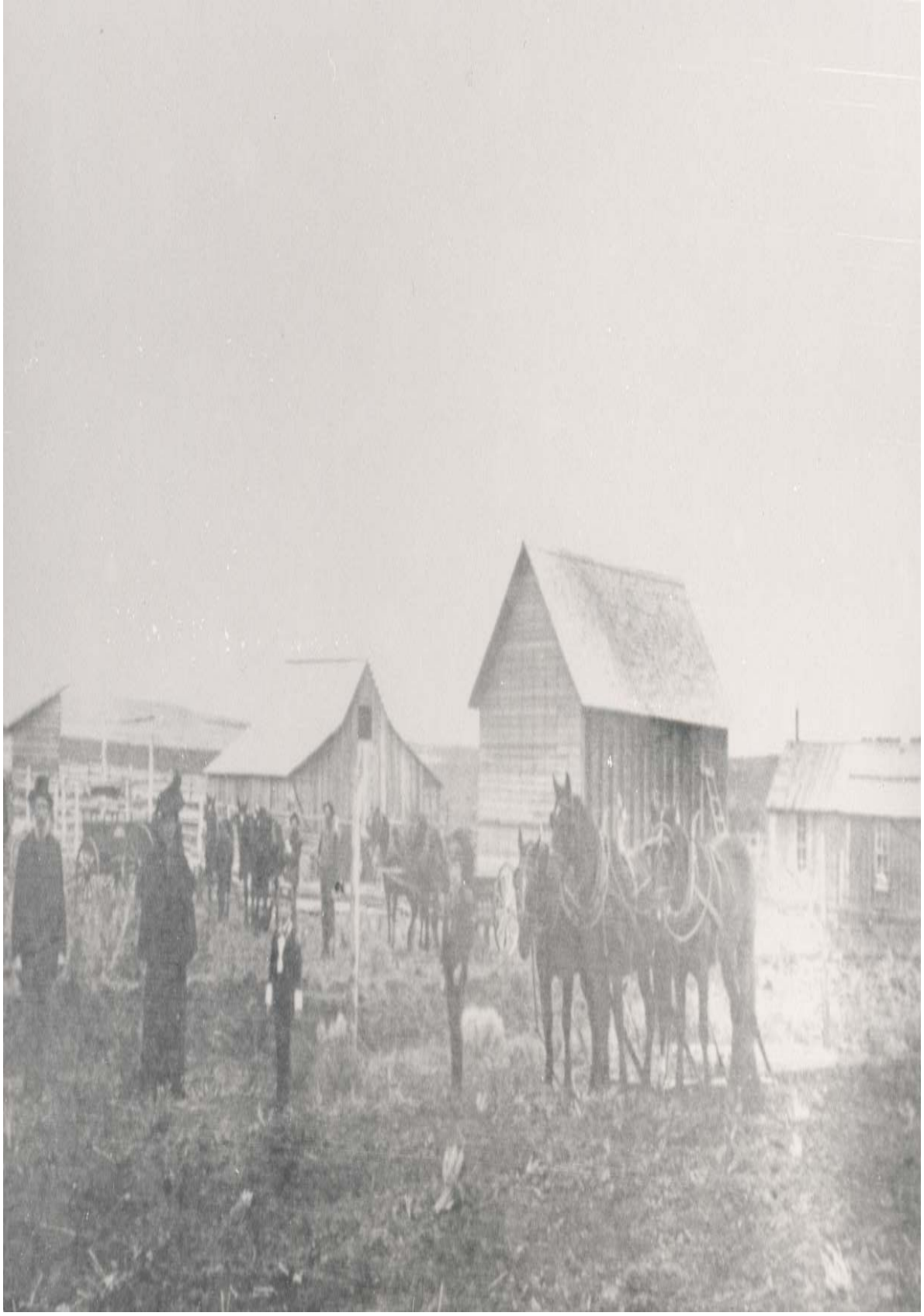
Write-Up Number (Ref)	Latitude	Longitude	Elev.	Land Use	Ecological Site Name	Ecological Site Number	USFS Plant Asociation	Range Similarity Index	Annual Production Lbs/Ac/Yr	Percent Useable Forage	Annual Stocking Rate
B41	N44 24 57.5	W121 25 10.6	2805.0	Native	Juniper-Pine-Fescue	**006XB002OR**	CPS2-11	47.2	354.6	55%	0.06
B42	N44 26 13.3	W121 21 25.6	2395.0	Native	Droughty South 9-12"	**010XB042OR**	CJS2-26	14.3	654.9	72%	0.15
B43	N44 26 28.4	W121 21 19.6	2435.0	Native	South 10-12"	**010XA007OR**	CJS2-26	58.4	534.7	81%	0.14
B44	N44 24 53.0	W121 21 34.2	2702.0	Native	Pumice Flat 8-10"	**010XA027OR**	CJS2-26	20.6	1196.3	70%	0.27
B45	N44 25 22.3	W121 22 33.2	2735.0	Native	South 10-12"	**010XA007OR**	CJS2-26	98.3	1790.8	74%	0.42
B46	N44 20 13.7	W121 21 11.8	2505.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-32	59.1	833.2	81%	0.21
B47	N44 25 59.1	W121 20 23.4	2769.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-12	45.1	601.2	73%	0.14
B48	N44 26 08.3	W121 20 08.7	2726.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-13	72.3	622.6	77%	0.15
B49	N44 25 24.9	W121 25 34.1	2777.0	Native	Wet Meadow	**010XY003OR**	Wet	9.9	873.5	98%	0.27
B50	N44 25 27.4	W121 25 29.1	2774.0	Native	Loamy Bottom	**010XY005OR**	Moist	7.7	941.9	93%	0.28
B51	N44 24 32.0	W121 18 04.5	2621.0	Native	South 10-12"	**010XA007OR**	CJS2-13	37.4	465.5	60%	0.09
B52	N44 30 6.8	W121 02 16.1	3116.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	26.6	1444.3	70%	0.32
B53	N44 29 55.9	W121 03 14.5	3060.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	23.4	446.3	70%	0.10
C01	N44-27-27.68	W121-2-48.55	3198.8	Seeded	Loamy 10-12"	**010XA018OR**	CSJ2-91	25.2	555.8	75%	0.13
C02	N44 28 53.47	W121 2 35.19	3094.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	16.5	1120.8	70%	0.25
C03	N44 29 55.64	W121 1 26.22	3186.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-91	579.0	579.0	70%	0.13
C04	N44 28 43.32	W121 4 0.19	3166.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	7.4	471.7	70%	0.10
C05	N44 27 53.92	W121 4 18.15	3248.0	Seeded	Pumice North 10-12"	**010XA026OR**	CJS2-91	11.9	458.8	75%	0.11

Write-Up Number (Ref)		Longitude	Elev.	Land Use		Ecological Number	Plant Asociation	Range Similarity Index	Annual Production	Percent Forage	Stocking Rate
C06	N44 28 14.59	W121 5 51.50	3176.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	22.3	618.0	70%	0.14
C07	N44 28 16.42	W121 6 51.84	3186.0	Native	Droughty 8-12"	**010XA019OR**	CJS2-26	50.8	605.5	70%	0.13
C08	N44 28 58.94	W121 5 30.98	3219.0	Seeded	JD Clayey 9-12"	**010XB022OR**	CJS2-91	18.9	531.3	70%	0.12
C09	N44 29 34.00	W121 5 33.46	3330.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-91	26.2	1311.9	80%	0.33
C10	N44 28 48.68	W121 6 48.31	3150.0	Native	South 10-12"	**010XA007OR**	CJS2-13	41.3	521.9	75%	0.12
C11	N44 28 40.62	W121 7 11.02	3025.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-92	28.4	505.0	80%	0.13
C12	N44 29 30.22	W121 6 34.27	3389.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-12	50.4	601.7	75%	0.14
C13	N44 27 29.16	W121 11 37.71	2969.0	Seeded	Pumice Hills 8-10"	**010XA002OR**	CJS2-91	13.7	336.8	60%	0.06
C14	N44 28 58.69	W121 10 15.78	3025.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	30.8	648.9	70%	0.14
C15	N44 28 32.08	W121 10 55.59	3170.0	Native	South 10-12"	**010XA007OR**	CJS2-13	67.0	657.1	70%	0.15
C16	N44 27 22.93	W121 9 39.88	3524.0	Native	Droughty Claypan 10-12"	**010XB024OR**	CJS2-26	48.7	745.0	85%	0.20
C17	N44 27 16.74	W121 9 36.39	3425.0	Native	South 10-12"	**010XA007OR**	CJS2-13	68.3	575.4	85%	0.15
C18	N44 28 07.39	W121 9 54.97	3550.0	Native	Droughty North 10-12"	**010XB084OR**	CJS2-12	61.8	703.0	80%	0.18
C19	N44 27 36.25	W121 7 57.75	3091.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	24.7	719.7	50%	0.11
C20	N44 28 33.81	W121 7 41.19	2940.0	Native	Loamy Bottom	**010XY005OR**	Moist	12.2	1868.4	70%	0.41
C21	N44 30 50.76	W121 4 15.67	3097.0	Native	Shallow South 10-14"	**008XY210OR**	CJS2-26	43.2	498.8	75%	0.12
C22	N44 31 44.86	W121 7 15.88	2858.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	20.4	477.4	70%	0.11
C23	N44 33 44.28	W121 6 55.90	2785.0	Native	South 10-12"	**010XA007OR**	CJS2-13	64.6	685.9	75%	0.16

Write-Up Number (Ref)		Longitude	Elev.	Land Use		Ecological Number	Plant Asociation	Range Similarity Index	Annual Production	Percent Forage	Stocking Rate
C24	N44 43 36.55	W121 7 48.25	2310.0	Native	Droughty South 9-12"	**010XB042OR**	CJS2-26	78.4	702.5	75%	0.17
C25	N44 42 36.43	W121 1 47.96	2270.0	Seeded	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	23.4	391.6	70%	0.09
C26	N44 40 54.69	W121 3 21.45	2500.0	Native	South 10-12"	**010XA007OR**	CJS2-13	25.4	366.1	50%	0.07
C27	N44 40 52.75	W121 1 48.21	2569.0	Seeded	Droughty South 9-12"	**010XB042OR**	CJS2-92	14.7	679.0	80%	0.19
C28	N44 43 15.70	W121 1 42.06	2336.0	Native	Pumice North 10-12"	**010XA026OR**	CJS2-12	55.3	562.8	75%	0.14
C29	N44 39 44.82	W121 1 57.75	2674.0	Seeded	Sandy North 10-12"	**010XA083OR**	CJS2-91	44.0	1239.5	75%	0.29
C30	N44 39 44.31	W121 1 02.92	2717.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-26	36.5	329.9	75%	0.08
C31	N44 38 44.88	W120 59 53.59	2913.0	Native	Shallow South 10-14"	**008XY210OR**	SD91-31	50.7	640.3	65%	0.13
C32	N44 38 06.10	W121 1 50.05	2805.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-32	71.0	674.1	75%	0.16
C33	N44 36 15.33	W121 11 52.94	2566.0	Native	Sandy North 10-12"	**010XA083OR**	CJS2-12	22.6	306.2	70%	0.06
C34	N44 36 28.23	W121 13 19.88	2782.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-92	15.2	227.5	60%	0.04
C35	N44 35 27.49	W121 4 58.77	2589.0	Native	Droughty Loam 8-10"	**010XA001OR**	CJS2-91	19.2	877.8	70%	0.19
C36	N44 34 46.74	W121 19 05.52	2428.0	Native	Pumice North 10-12"	**010XA026OR**	CJS2-12	55.7	531.6	75%	0.13
C37	N44 35 13.44	W121 17 18.74	2520.0	Seeded	Loamy 10-12"	**010XA018OR**	CJS2-92	31.6	821.7	80%	0.21
C38	N44 33 39.63	W121 19 36.08	2618.0	Native	Very Shalow Loam 10-14"	**008XY150OR**	SD91-31	43.4	235.0	90%	0.07
C39	N44 23 49.59	W121 18 31.75	2795.0	Native	South 10-12"	**010XA007OR**	CJS2-13	70.1	627.7	75%	0.15
C40	N44 24 51.30	W121 18 07.12	2694.0	Native	Shallow North 10-12"	**010XA025OR**	CJS2-26	17.8	176.0	70%	0.04
D01	N44 24 48	W121 23 59	2744.0	Native	Juniper-Pine-Fescue	**006XB002OR**	CPS2-11	73.5	819.1	63%	0.16

Write-Up Number (Ref)		Longitude	Elev.	Land Use		Ecological Number	Plant Asociation	Range Similarity Index	Annual Production	Percent Forage	Stocking Rate
D02	N44 24 53	W121 23 24	2809.0	Native	Pumice North 10-12"	**010XA026OR**	CJS2-32	34.8	548.5	64%	0.11

Appendix AB Soil and Map Unit Field and Publication Symbols

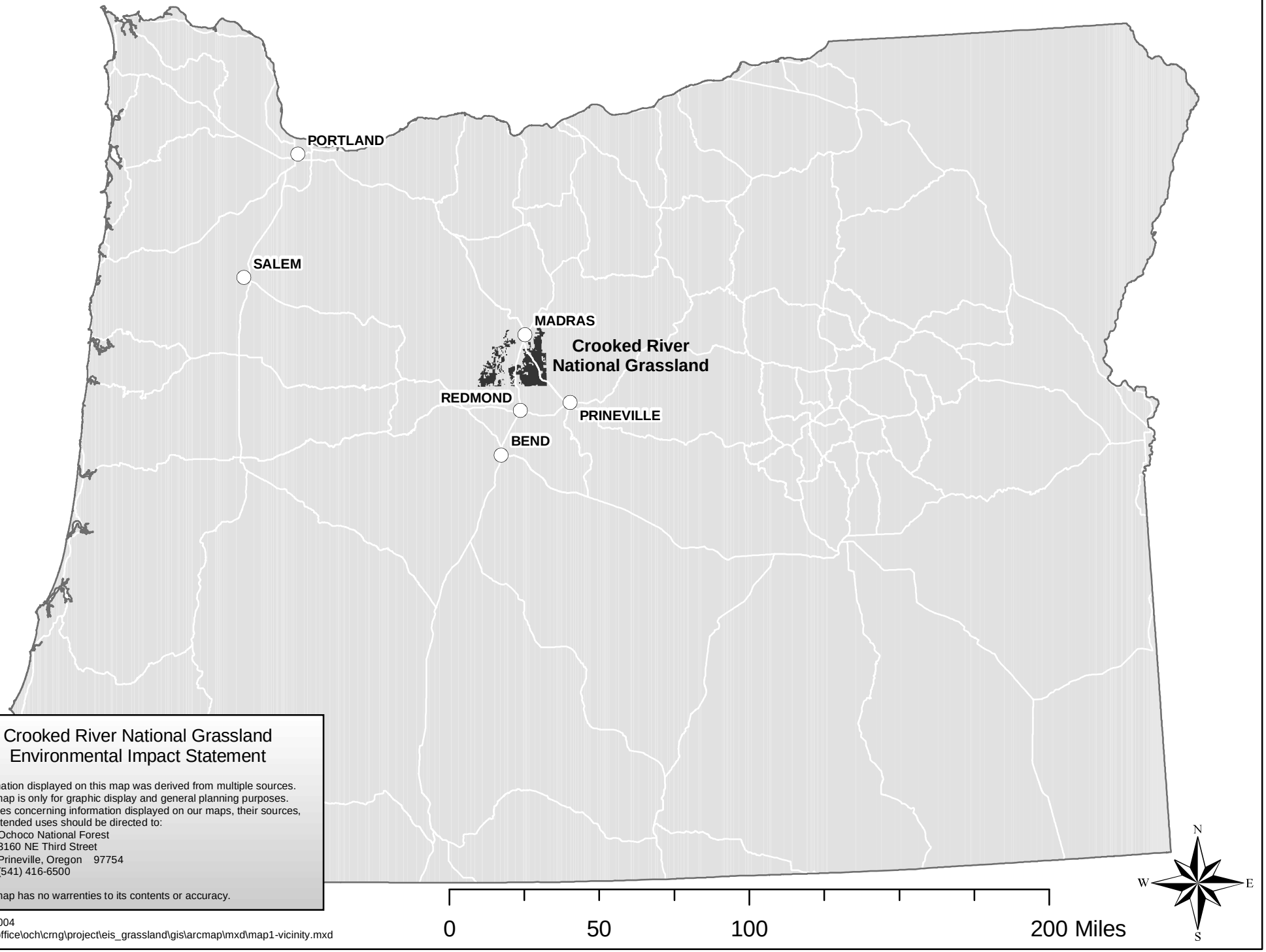


FIELD	Publication	Map Unit Name
MAP_UNIT_Symbol	Upper Des River Area	
297	65A	Houstake sandy loam, 0 to 3 percent slopes
300	33B	Deschutes- Stukel complex, dry, 0 to 8 percent slopes
302	142B	Stukel-Rock OC- Deschutes complex, dry, 0 to 8 percent slopes
317	81F	Lickskillet- Rock OC complex, 45 to 80 percent slopes
319	101D	Redcliff-Lickskillet-Rock OC complex, 15 to 30 percent slopes
321	104A	Redmond sandy loam, dry, 0 to 3 percent slopes
323	31A	Deschutes sandy loam, 0 to 3 percent slopes
324	138A	Stukel sandy loam, dry, 0 to 3 percent slopes
325	138B	Stukel sandy loam, dry, 3 to 8 percent slopes
328	151D	Tetherow-Clovcamp complex, 8 to 65 percent slopes
331	86A	Madras sandy loam, 0 to 3 percent
351	111D	Searles-Holmzie complex, 15 to 30 percent slopes
355	101E	Redcliff-Lickskillet-Rock OC complex, 30 to 50 percent south slopes
360	106E	Redslide-Lickskillet complex, 30 to 50 percent north slopes
362	106D	Redslide-Lickskillet complex, 15 to 30 percent north slopes
363	100C	Redcliff- Lickskillet complex, 0 to 15 percent slopes
369	81F	Lickskillet- Rock OC complex, 45 to 80 percent slopes
372	157C	Wanoga-Fremkle-Rock outcrop complex, 0 to 15 percent slopes
374	155D	Wanoga sandy loam, 15 to 30 percent slopes
375	155E	Wanoga sandy loam, 30 to 50 percent slopes
380	31B	Deschutes sandy loam, 3 to 8 percent slopes
387	141C	Stukel- Deschutes- Rock OC complex, 0 to 15 percent slopes
399	71A	Lafollette sandy loam, 0 to 3 percent slopes
410	37B	Deskamp sandy loam, 3 to 8 percent slopes
422	156C	Wanoga-Fremkle-Henkle complex, 0 to 15 percent slopes
423	156D	Wanoga-Fremkle-Henkle complex, 15 to 30 percent slopes
424	31A	Deschutes sandy loam, dry, 0 to 3 percent
435	34C	Deschutes- Stukel complex, dry, 0 to 15 percent slopes
491	138B	Stukel sandy loam, 3 to 8 percent slopes
500	86B	Madras sandy loam, 3 to 8 percent slopes
502	87A	Madras loam, 0 to 3 percent slopes
503	87B	Madras loam, 3 to 8 percent slopes
510	30A	Cullius loam, 0 to 3 percent slopes
512	30B	Cullius loam, 3 to 8 percent slopes
514	30C	Cullius loam, 8 to 15 percent slopes
520	45A	Era sandy loam, cobbly substratum, 0 to 3 percent slopes
522	45B	Era sandy loam, 3 to 8 percent slopes
524	45B	Era sandy loam, 3 to 8 percent slopes
530	45A	Era sandy loam, cobbly substratum, 0 to 3 percent slopes
532	45B	Era sandy loam, 3 to 8 percent slopes
538		not listed
552	2A	Agency loam, 0 to 3 percent slopes
554	2A	Agency loam, 0 to 3 percent slopes
555	2C	Agency loam, 8 to 15 percent slopes
556	1A	Agency sandy loam, 0 to 3 percent
560		not listed
562	64C	Holmzie-Searles complex, moist, 0 to 15 percent slopes

FIELD	Publication	Map Unit Name
MAP_UNIT_Symbol	Upper Des River Area	
564	111D	Searles-Holmzie complex,moist, 15 to 30 percent slopes
569	119D	Simas- Ruckles complex, 15 to 40 percent south slopes
570	121F	Simas- Ruckles complex, 40 to 80 percent south slopes
571	49A	Fluvents, 0 to 1 percent slopes
572	120F	Simas- Ruckles complex, 40 to 80 percent north slopes
573	118D	Simas- Ruckles complex, 15 to 40 percent north slopes
580	1A	Agency sandy loam, 0 to 3 percent
582	6A	Bakeoven very cobbly loam, 0 to 3 percent slopes
583	24A	Caphealy- Reuter complex, 0 to 3 percent slopes
584	80D	Lickskillet- Redcliff complex,grv, 15 to 30 percent slopes
585	24B	Caphealy- Reuter complex, 3 to 8 percent slopes
586		not listed
587	24C	Caphealy- Reuter complex, 8 to 15 percent slopes
588	24D	Caphealy- Reuter complex, 15 to 35 percent slopes
589	105C	Redmond- Deschutes- Stukel complex, 0 to 15 percent slopes
590	117C	Simas silt loam, 0 to 15 percent slopes
591	46B	Era- Haystack complex, 0 to 8 percent slopes
592	87A	Madras loam, 0 to 3 percent slopes
594	87B	Madras loam, 3 to 8 percent slopes
596	87C	Madras loam, 8 to 15 percent slopes
597		not listed
599	79C	Lickskillet- Redcliff complex, grv, 0 to 15 percent slopes
600	80D	Lickskillet- Redcliff complex, grv, 15 to 30 percent south slopes
601	110D	Schrier- Tub complex, 15 to 30 percent north slopes
602	110E	Schrier- Tub complex, 30 to 60 percent north slopes
603	166D	Xerolls, 5 to 50 percent slopes
604	80E	Lickskillet- Redcliff complex, grv, 30 to 60 percent south slopes
606	81F	Lickskillet- Rock OC complex, 45 to 80 percent slopes
610	3B	Agency- Madras complex, 0 to 8 percent slopes
612	3B	Agency- Madras complex, 0 to 8 percent slopes
614	3C	Agency- Madras complex, 8 to 15 percent slopes
617	121F	Simas- Ruckles complex, 40 to 80 percent south slopes
618	63C	Holmzie-Searles complex, moist, 0 to 15 percent slopes
619	7A	Bakeoven- Agency- Madras complex, 0 to 3 percent slopes
620	5A	Aquolls, 0 to 1 percent
688		not listed
800	97	pits- gravel, rock and cinder
AGC	AGC	Agency loam, 1 to 2 percent slopes
BAC	BAC	Bakeoven very cobbly loam, 2 to 20 percent slopes
BYF	BYF	Boardtree and Yawkey gravelly loams, 20 to 70 percent slopes
CRB	CRB	Court sandy loam, 1 to 8 percent slopes
CTE	CTE	Curant and Tub silt loams, 8 to 40 percent slopes
CTF	CTF	Curant and Tub silt loams, 40 to 70 percent slopes
DAE	DAE	Day clay, 8 to 40 percent slopes
DGC	DGC	Degner soils, 2 to 12 percent slopes
DOE	DOE	Donnybrook stony loam, 10 to 40 percent slopes
DP	DP	Dry Pine- top of Pine Ridge, 5 to 40 percent slopes
ERB	ERB	Era soils, 1 to 8 percent slopes

FIELD	Publication	Map Unit Name
MAP_UNIT_Symbol	Upper Des River Area	
ERE	ERE	Era soils, 8 to 40 percent slopes
GNF	GNF	Ginser very stony loam, 35 to 60 percent slopes
GRD	GRD	Gribble cobble loam, 5 to 20 percent slopes
HAE	HAE	Hankins cobbly loam, 15 to 50 percent slopes
LAC	LAC	Lamonta cobbly loam, 1 to 12 percent slopes
LAK	LAK	lake
LCE	LCE	Lickskillet very stony loam, 15 to 40 percent slopes
LCF	LCF	Lickskillet extremely stony loam, 40 to 70 percent slopes
LEF	LEF	Lickskillet extremely stony loam, 40 to 70 percent slopes
MAC	MAC	Madras loam, 1 to 12 percent slopes
MBE	MBE	Madras soils, 12 to 40 percent slopes
MCD	MCD	McCoin loam, 5 to 20 percent slopes
MMC	MMC	McMeen silt loam, 1 to 12 percent slopes
MTB	MTB	Metolius sandy loam, 0 to 8 percent slopes
MX	MX	Mixed alluvial land
PRE	PRE	Prag cobbly loam, 5 to 40 percent slopes
RA	RA	Rail clay
RU	RU	Rough, broken and stony land
SEF	SEF	Searles very stony loam, 35 to 65 percent slopes
SIE	SIE	Simas cobbly silty clay loam, 10 to 35 percent slopes
SMF	SMF	Simas very stony silty clay loam, 35 to 70 percent
SNE	SNE	Simas soils, 8 to 40 percent slopes
SUE (SOE)	SUE (SOE)	Sorf very stony loam, 5 to 40 percent slopes
TGC	TGC	Tub gravelly clay loam, 1 to 12 percent slopes
THE	THE	Tub cobbly clay loam, 12 to 40 percent slopes
TVD	TVD	Tub very stony soils, 1 to 20 percent slopes
W	W	water
WATER	WATER	water
WD	WD	Willowdale loam

Map1 - General Vicinity Map



Crooked River National Grassland
Environmental Impact Statement

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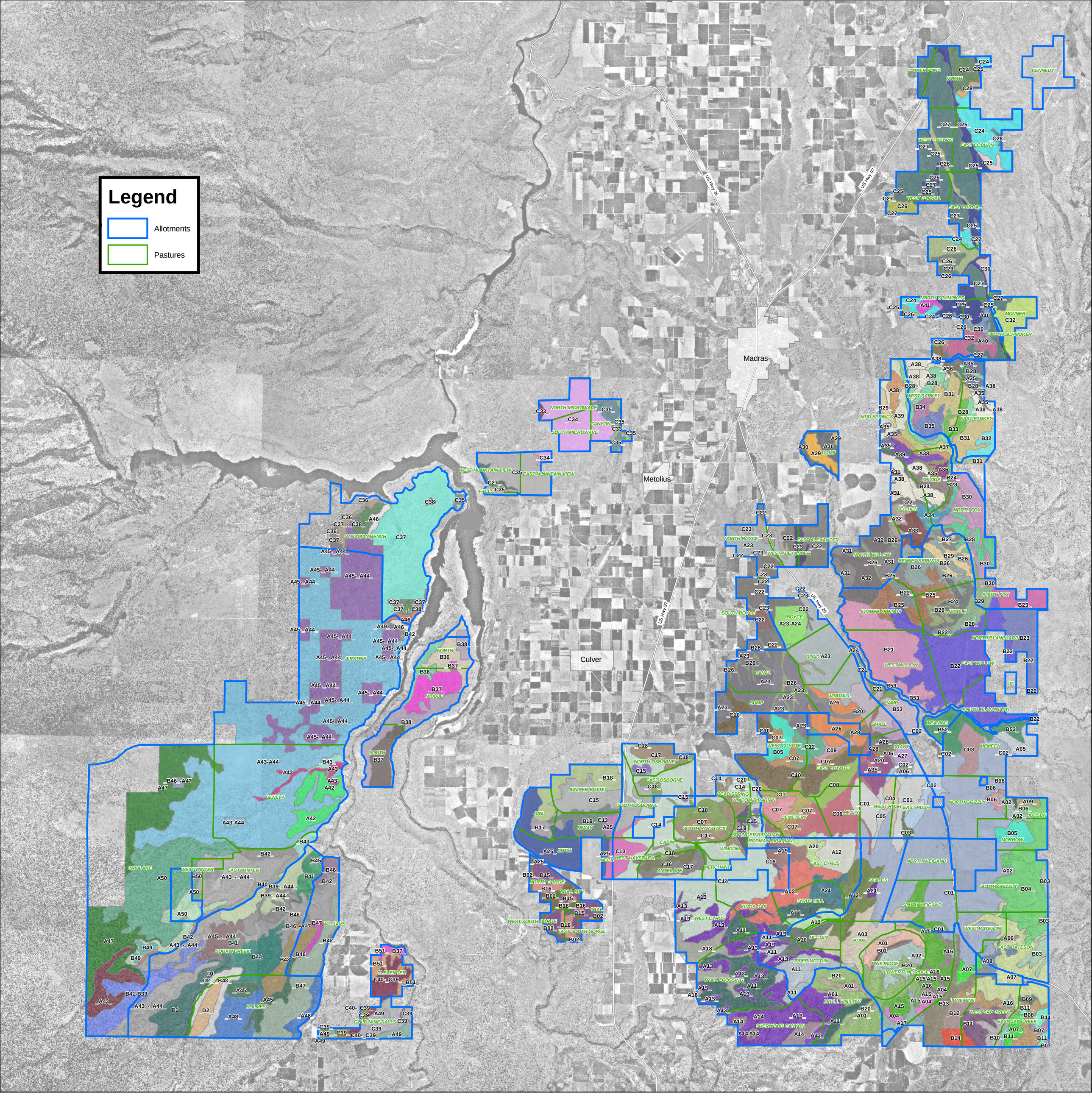

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Map 2 - Ecological Site Inventory

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

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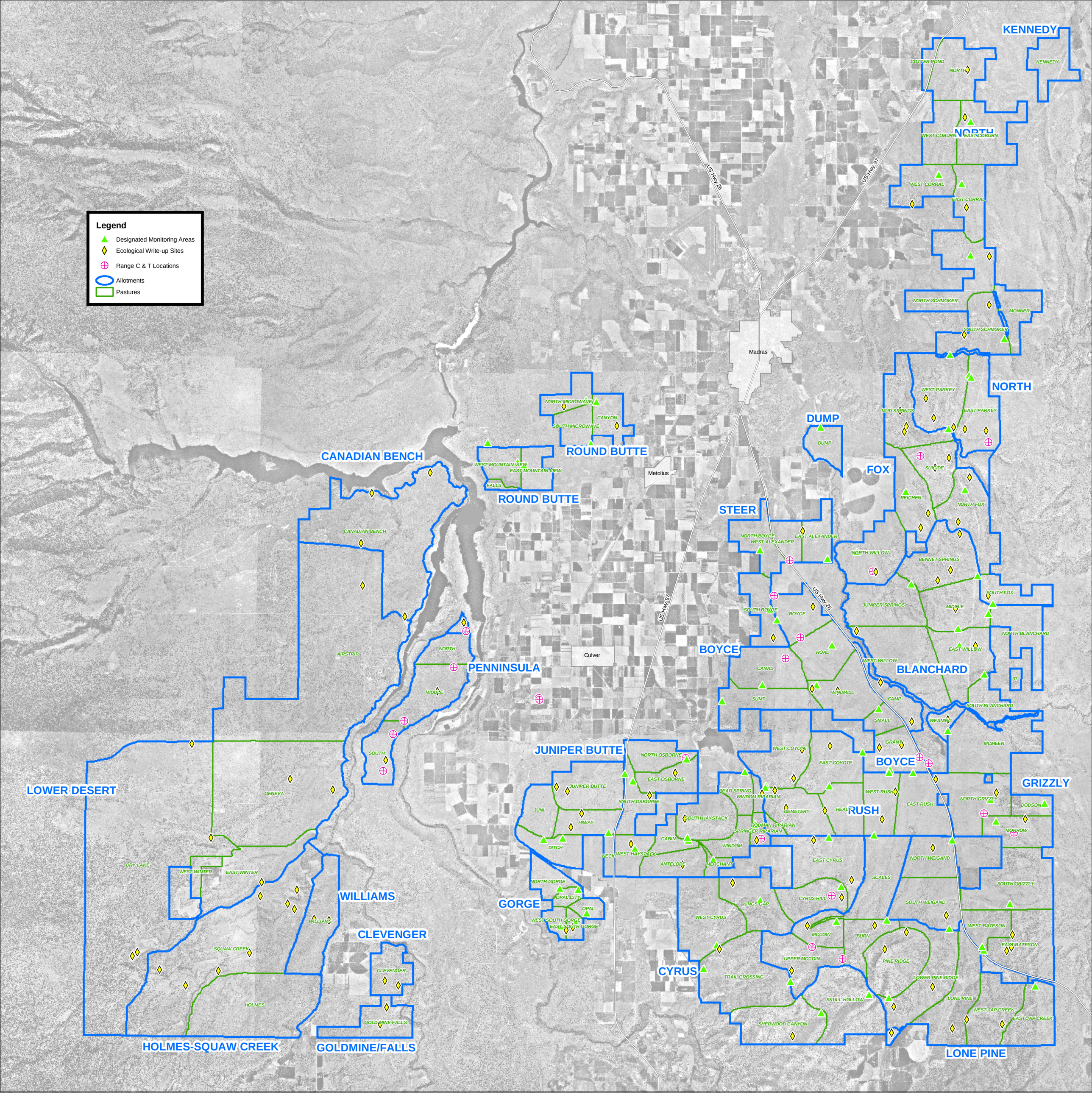

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Map 3 - Grazing Allotments, Designated Monitoring Areas, C & T Clusters, and Range Ecological Site Write-ups

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

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09/03/2004 RJM
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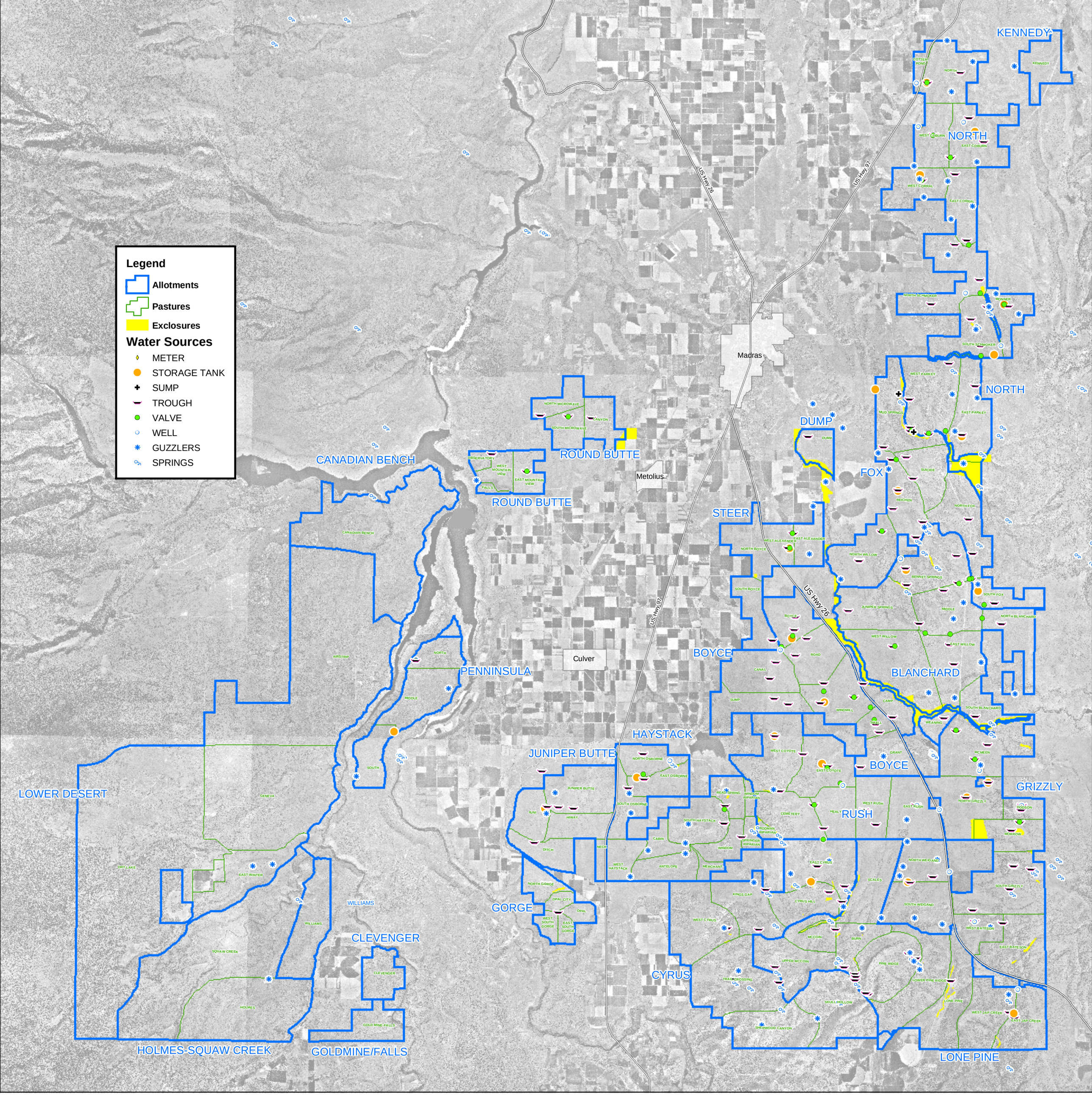

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Map 4 - Water Sources,Spring Developments,Guzzlers, Fences and Exclosures

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

10/01/2004 RJM
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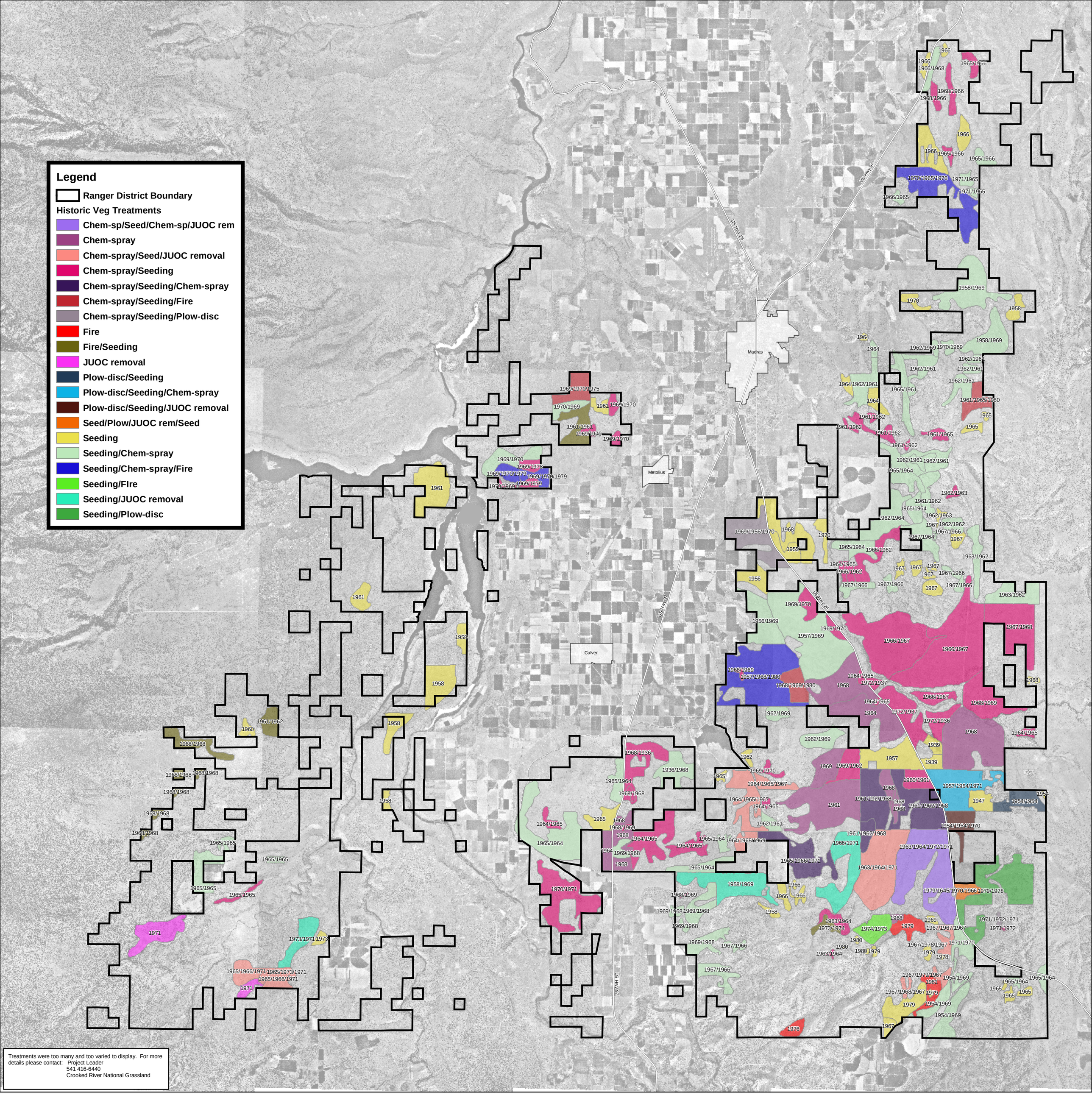

Treatments were too many and too varied to display. For more details please contact: Project Leader
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Map 5 - Historical Vegetation Treatments

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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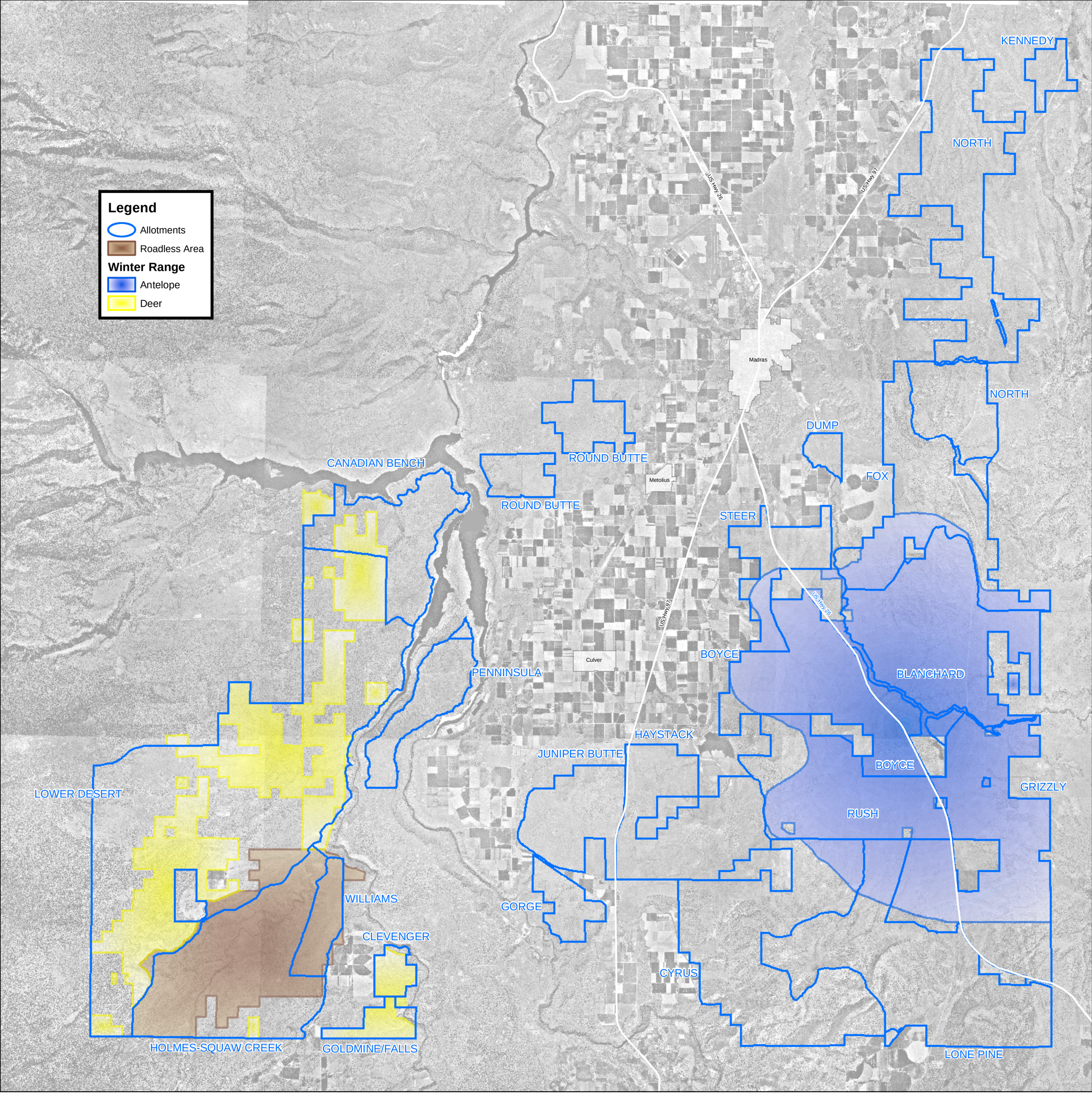

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Map 6 - Special Management Areas

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004
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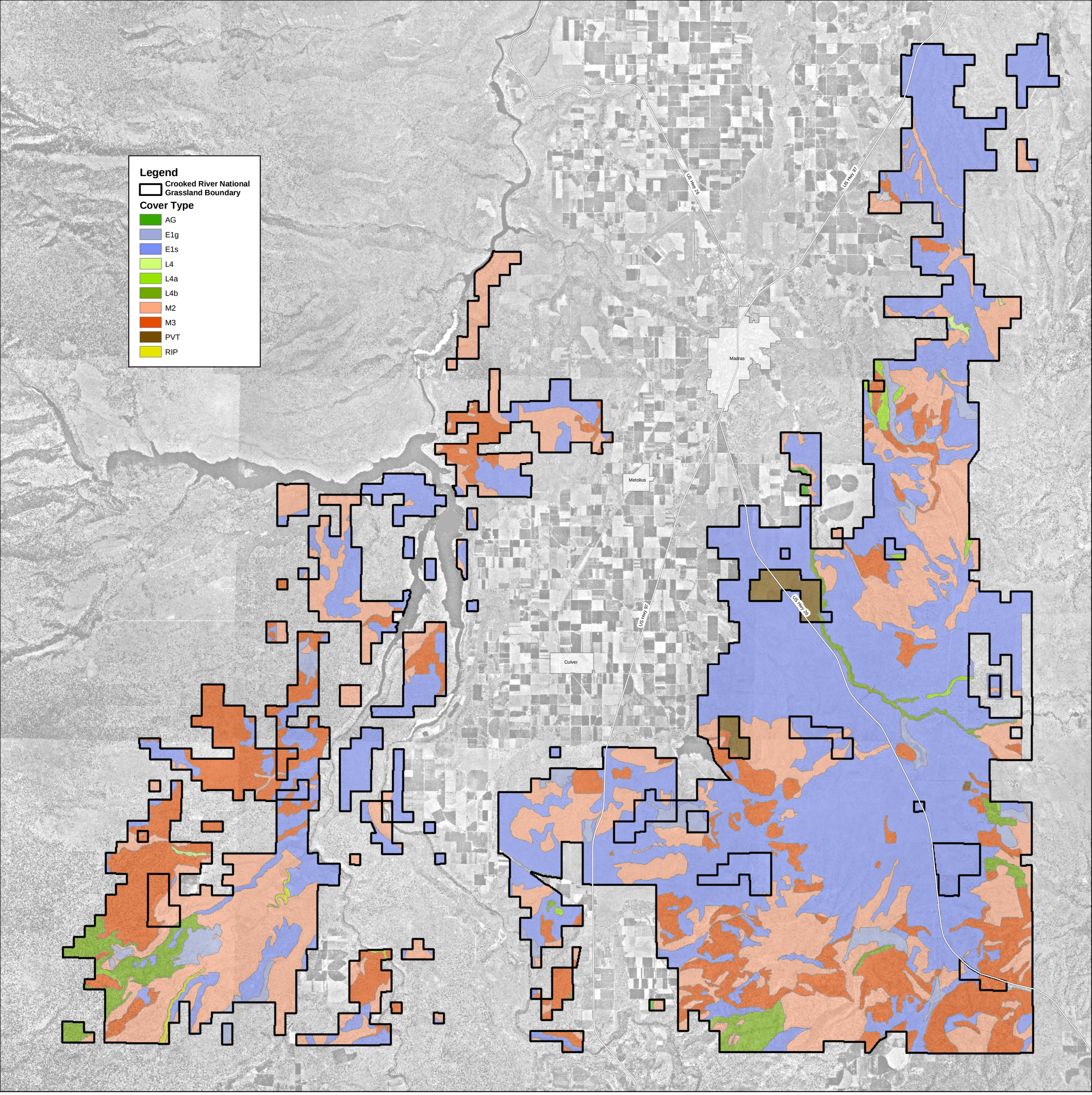

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Map 7 - Alternative A - No Action

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004
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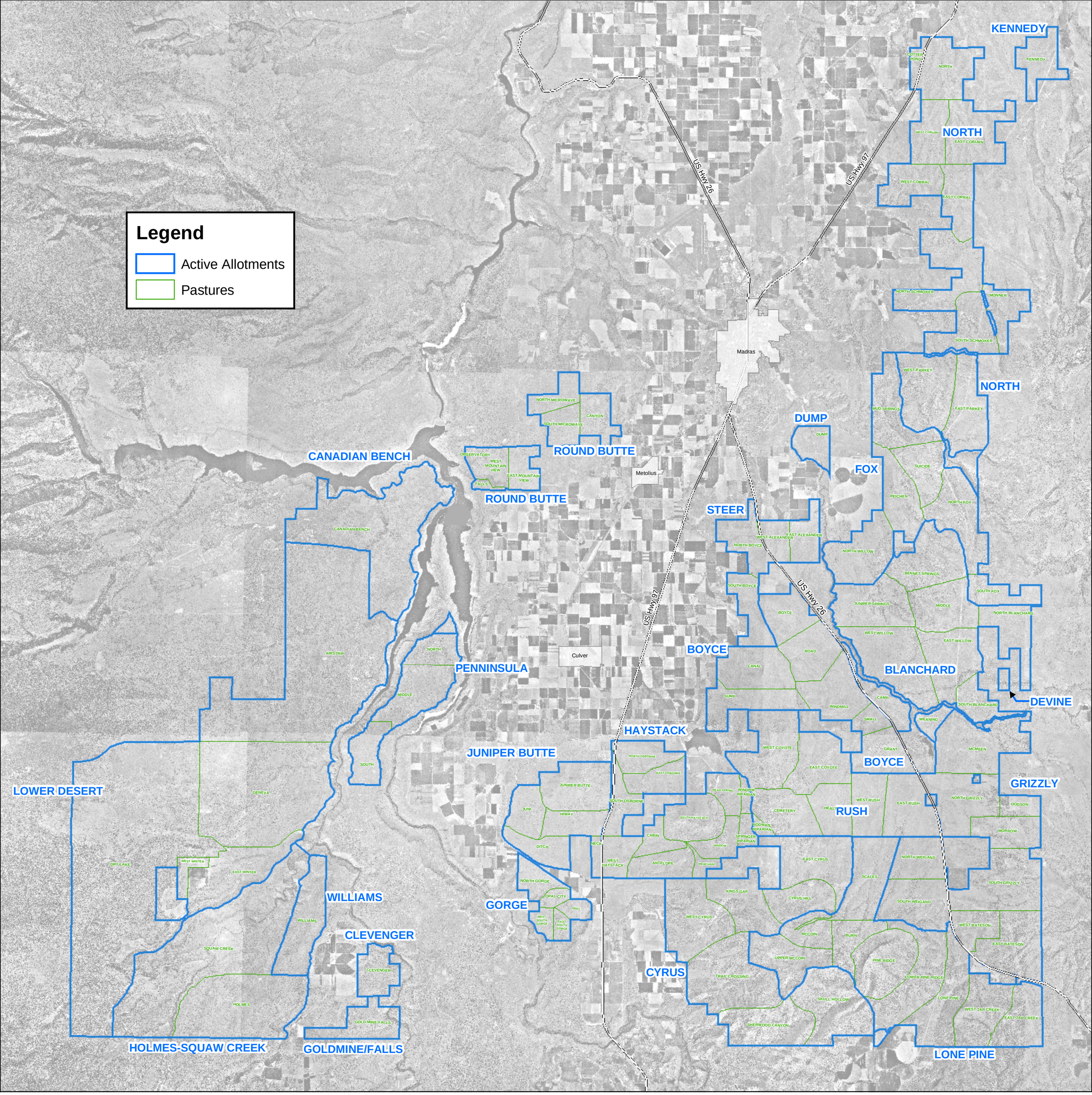

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Map 8 - Alternative B - Current Management

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004
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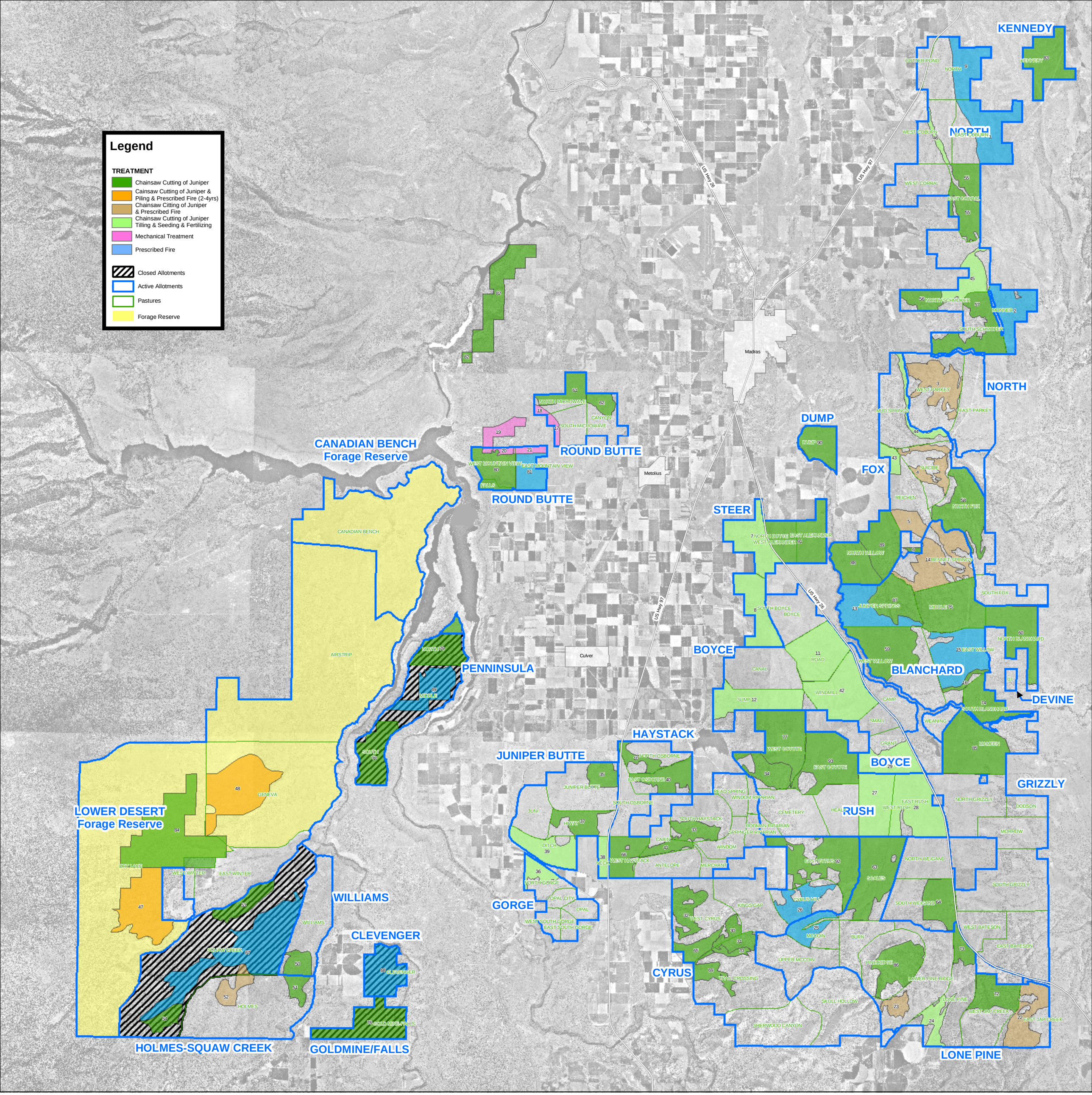

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Map 9 - Alternative C - Proposed Action

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/11/2004 RJM
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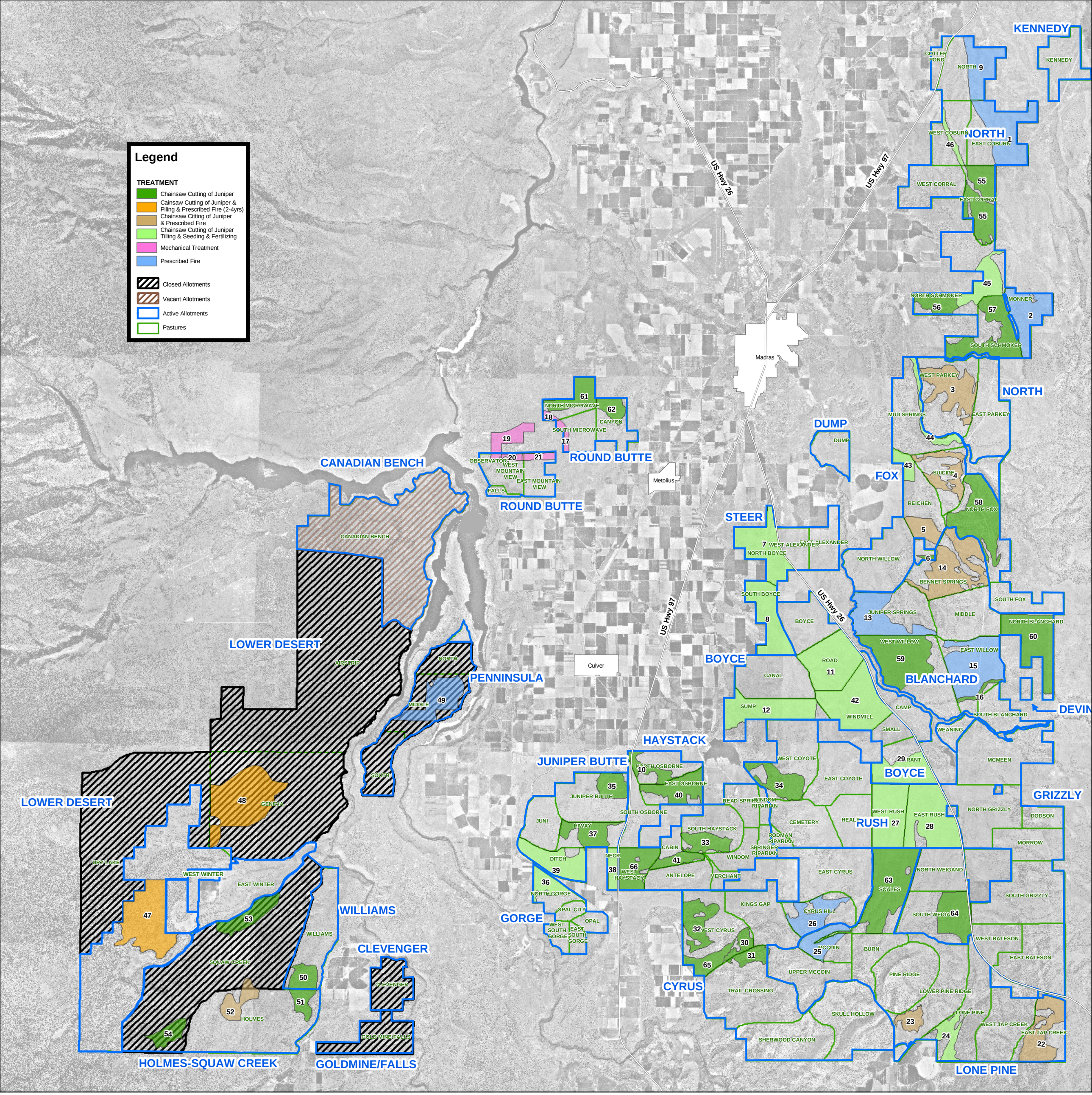

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Map 10 - Alternative D

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/11/2004
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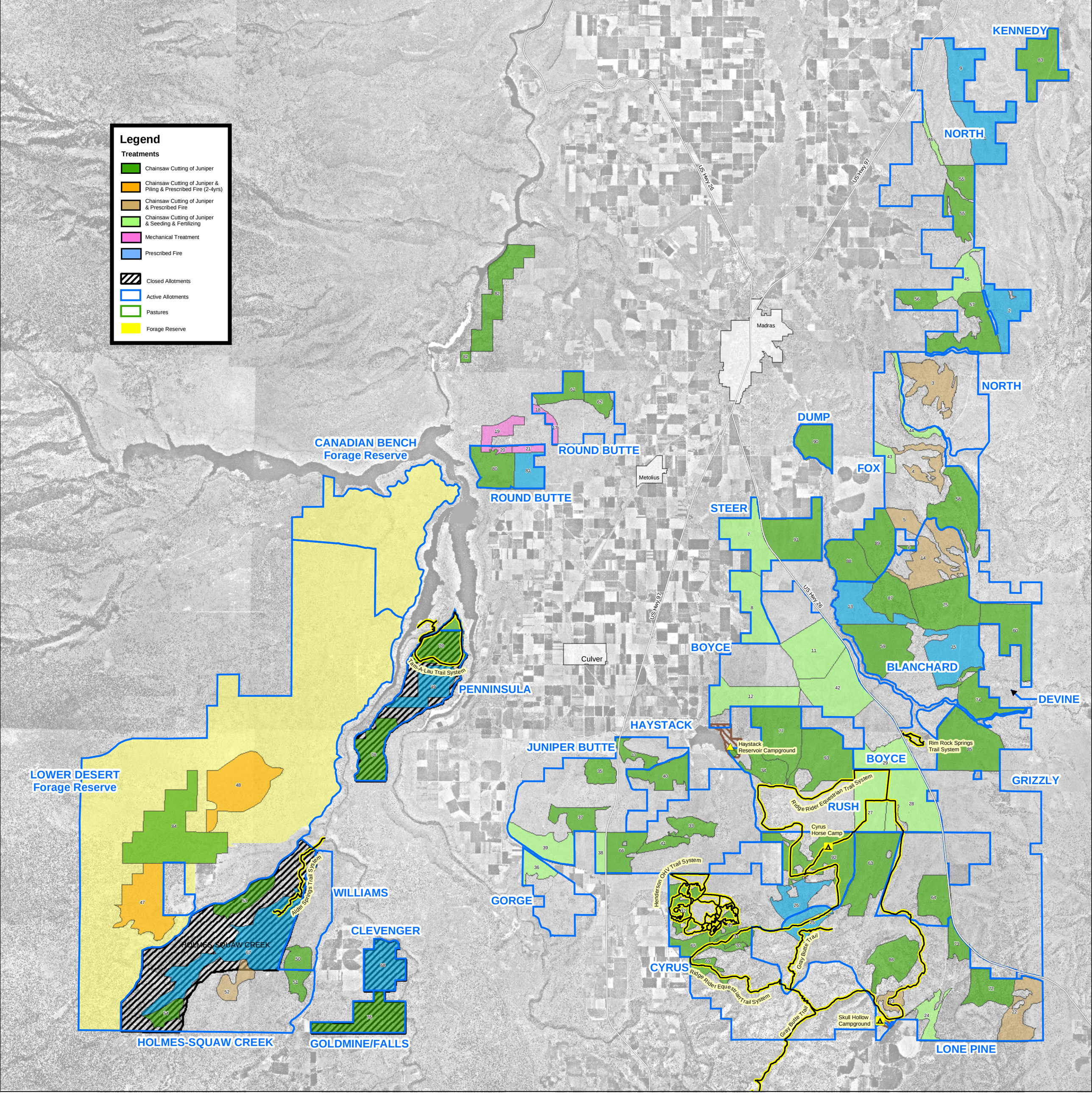

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Map 11 - Alternative C - Proposed Action with Recreation

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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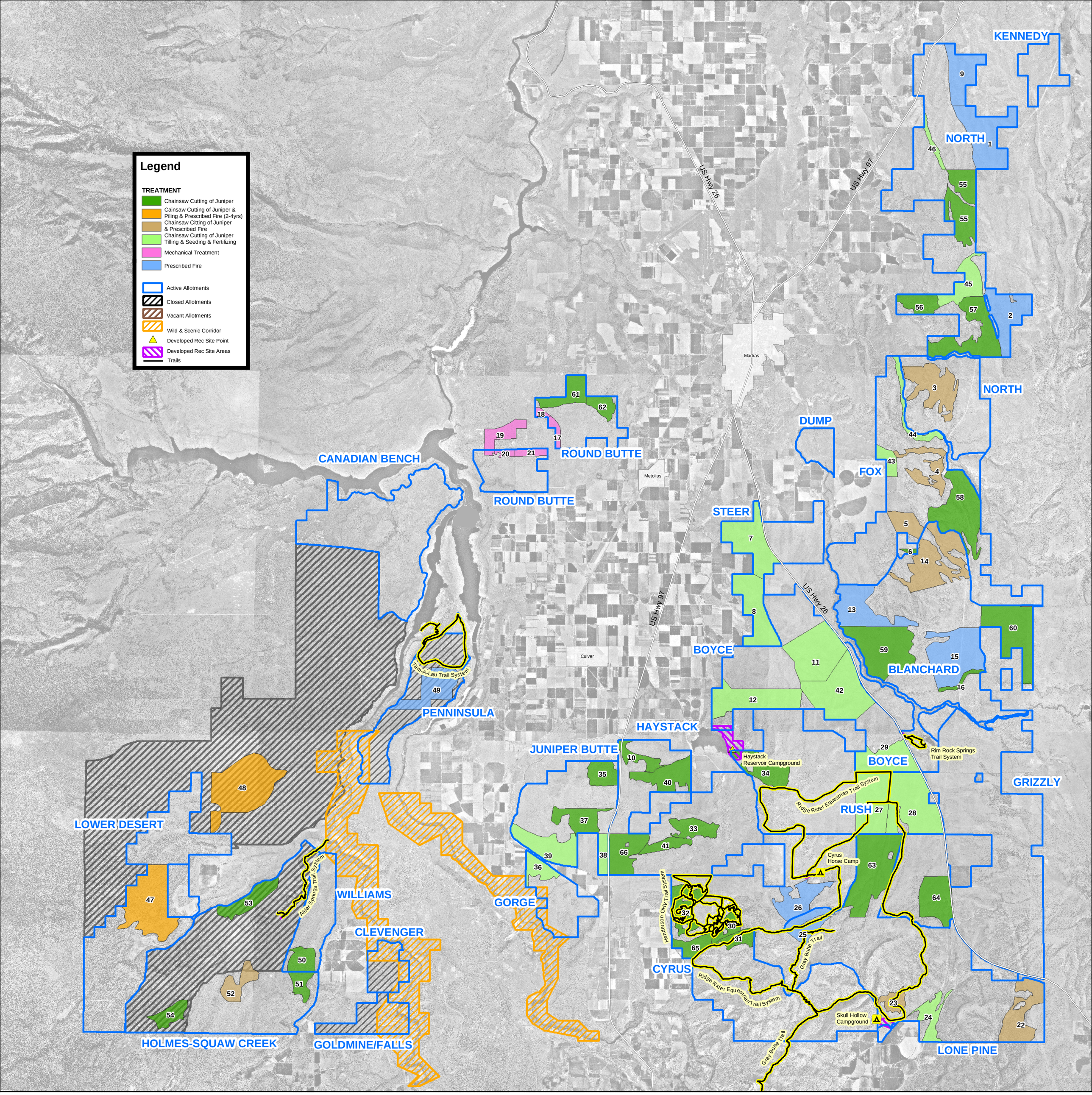

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Map 12 - Alternative D with Recreation

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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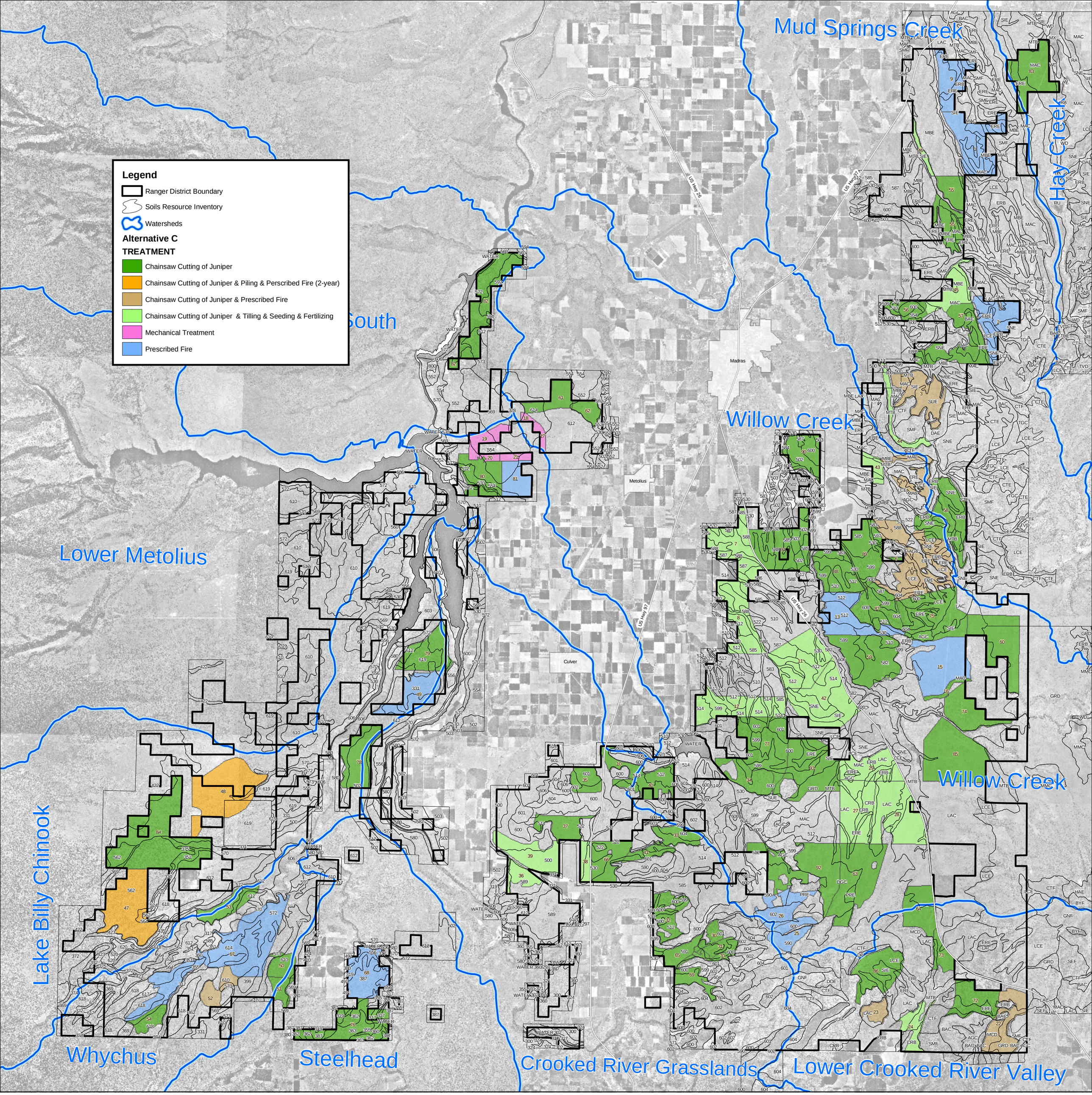

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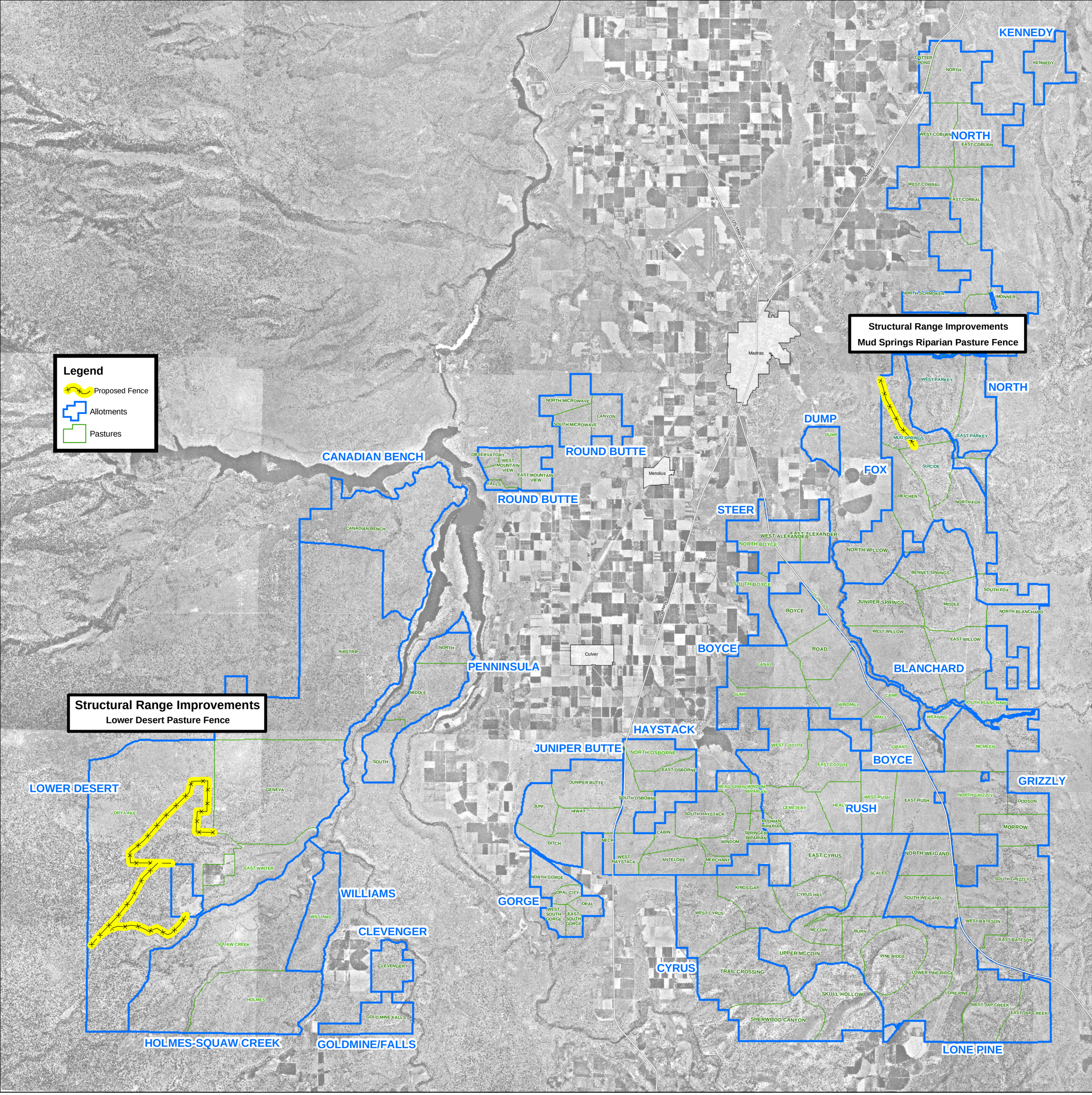
Map 13 - Soils Resource Inventory

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S



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Map 14 - Proposed Fence Location Changes - Alt C & D

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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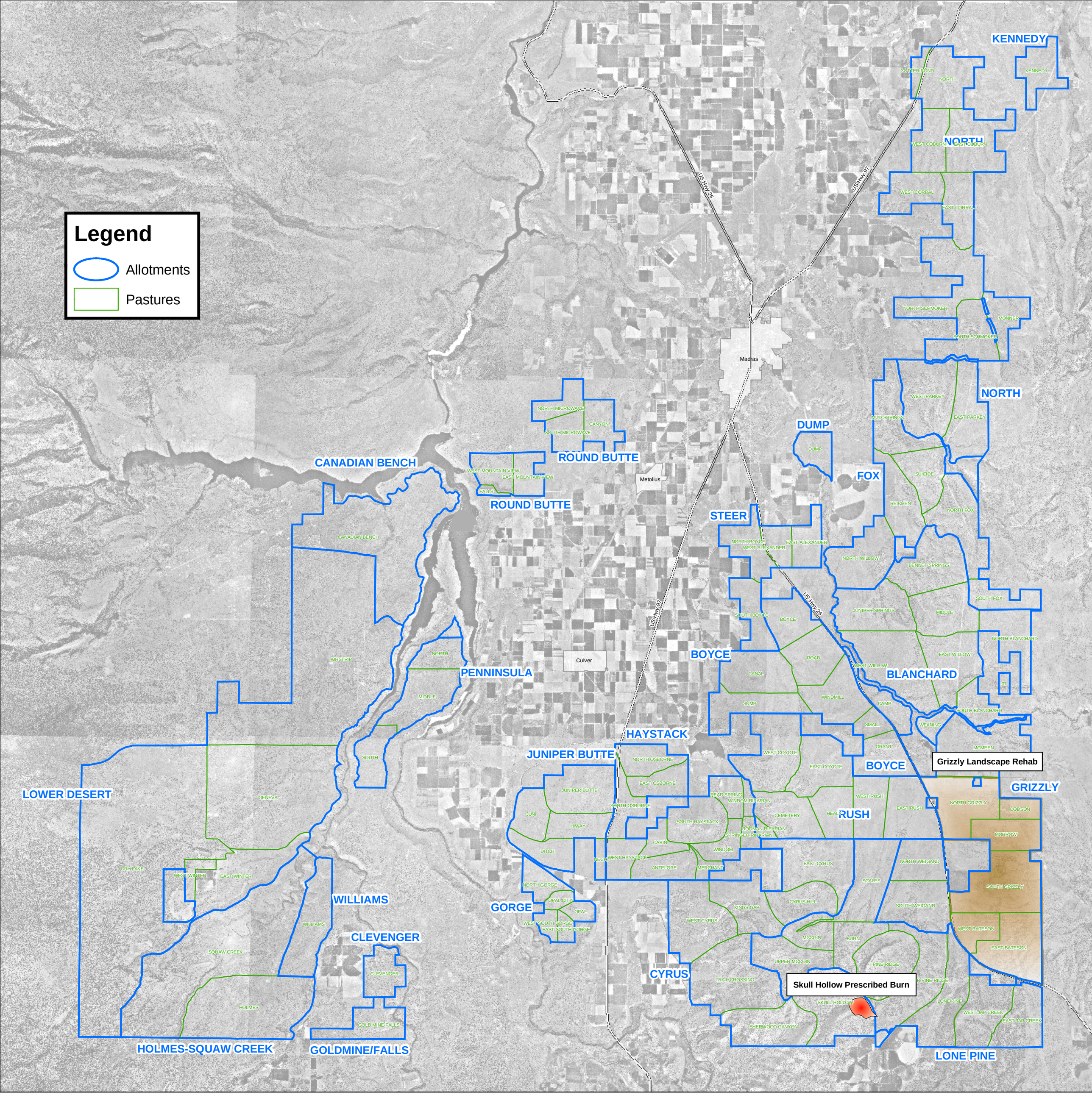

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Map 15 - Grizzly Landscape Rehab Project and Skull Hollow Prescribed Burn

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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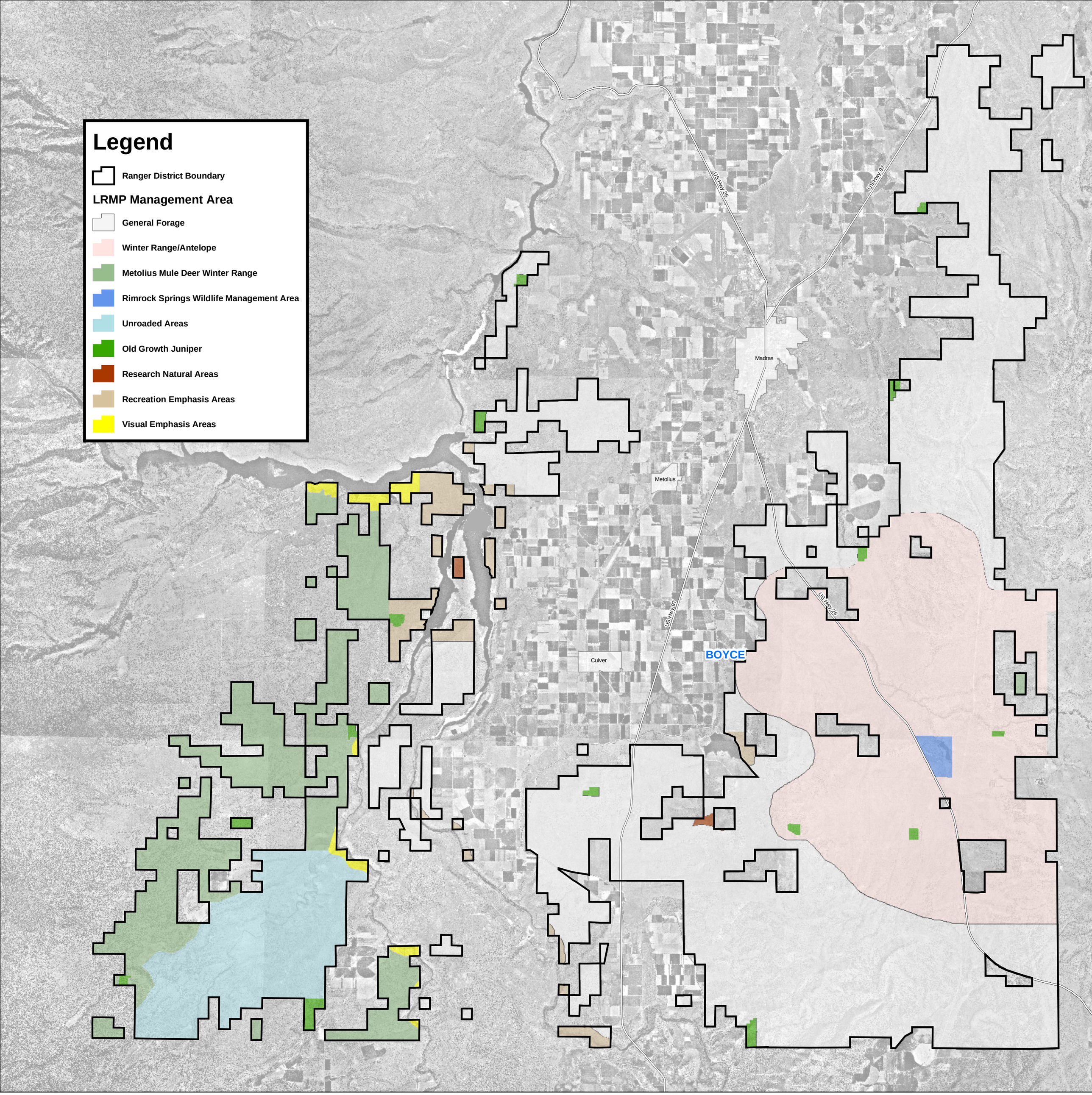

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Map 16 - LRMP - Management Areas

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/04/2004 RJM
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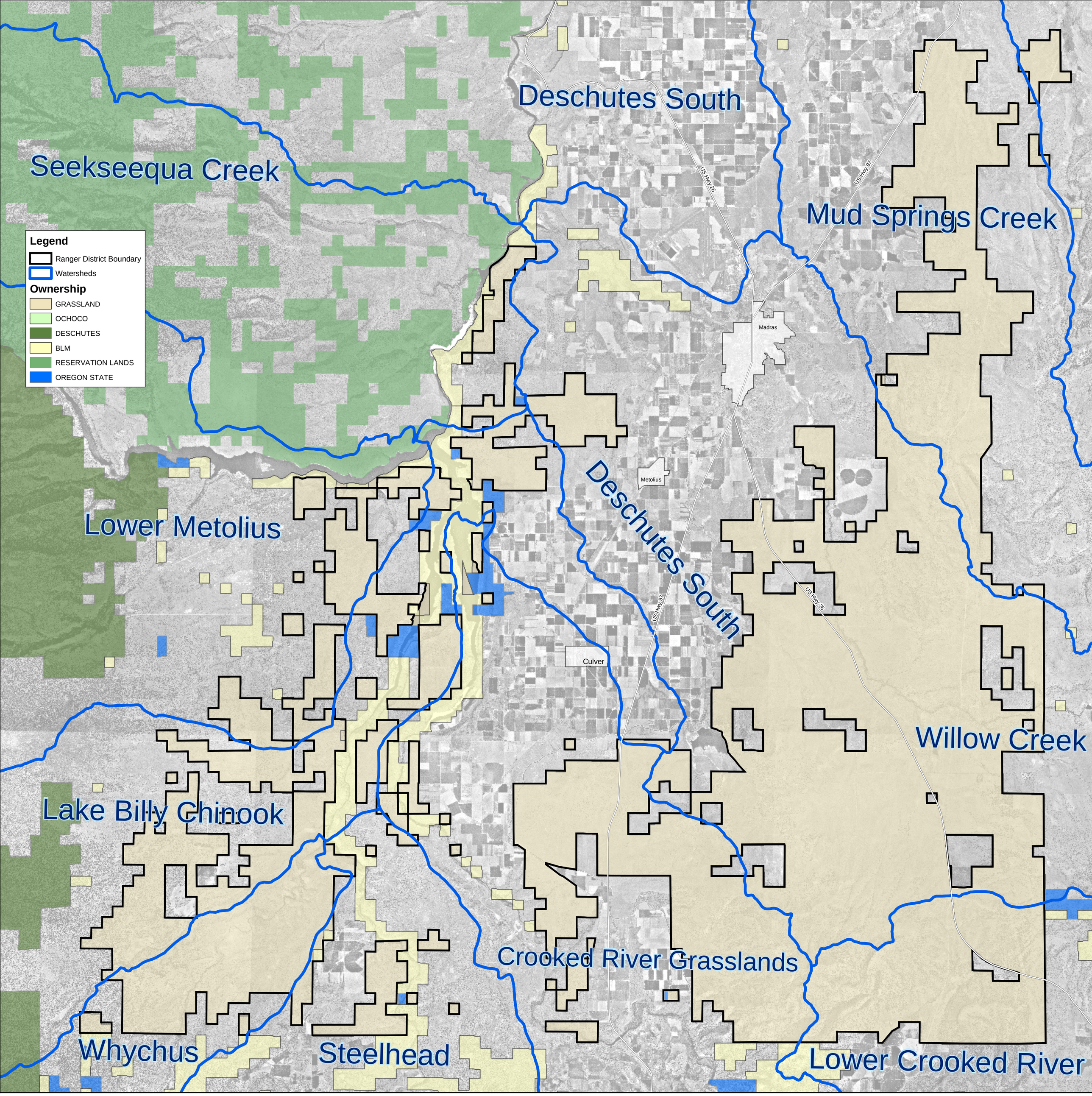

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Map 17 - Ownership & Watersheds

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

00/04/2004 RJM
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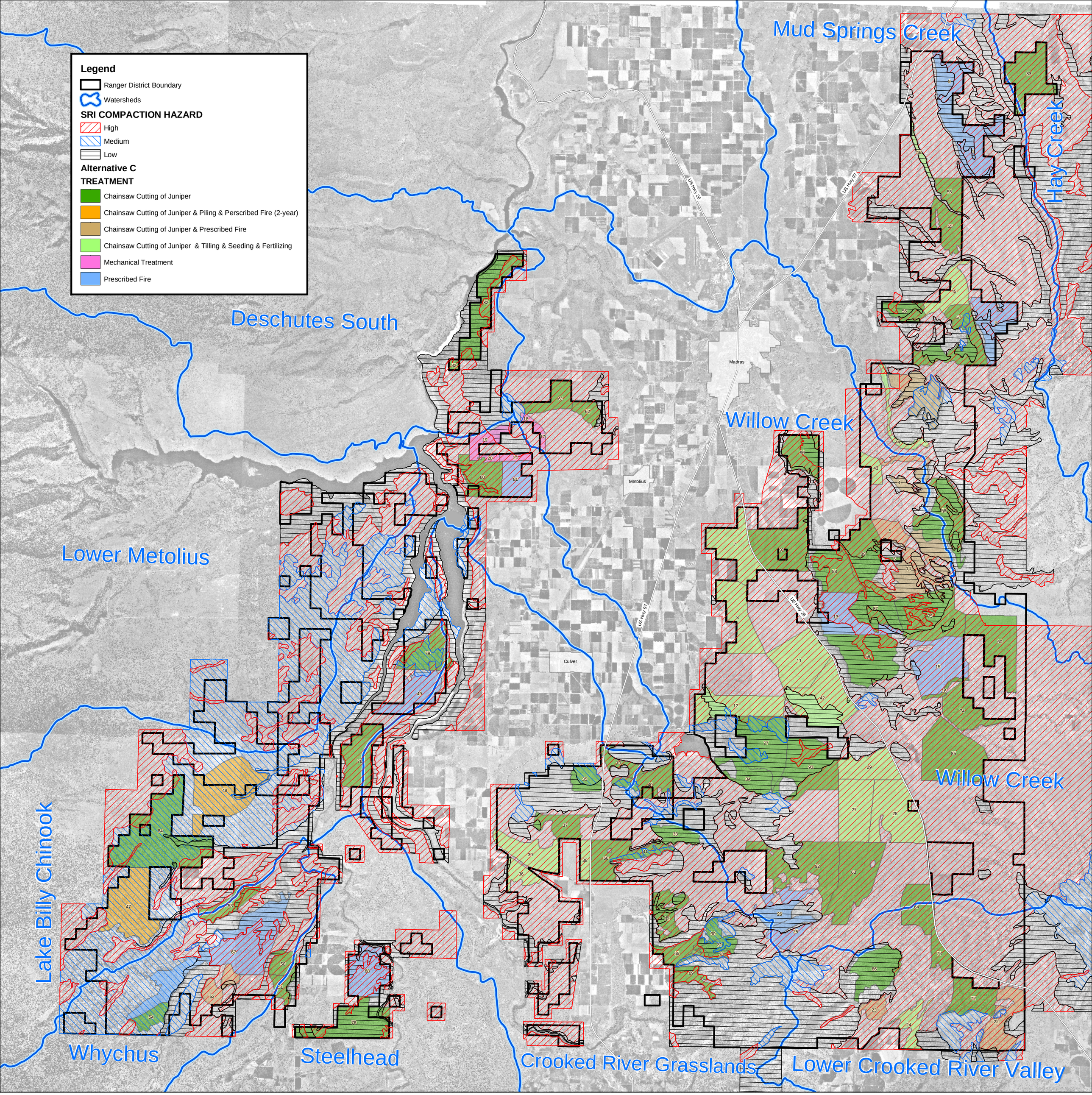

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Map 19 - Soil Compaction Hazard

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

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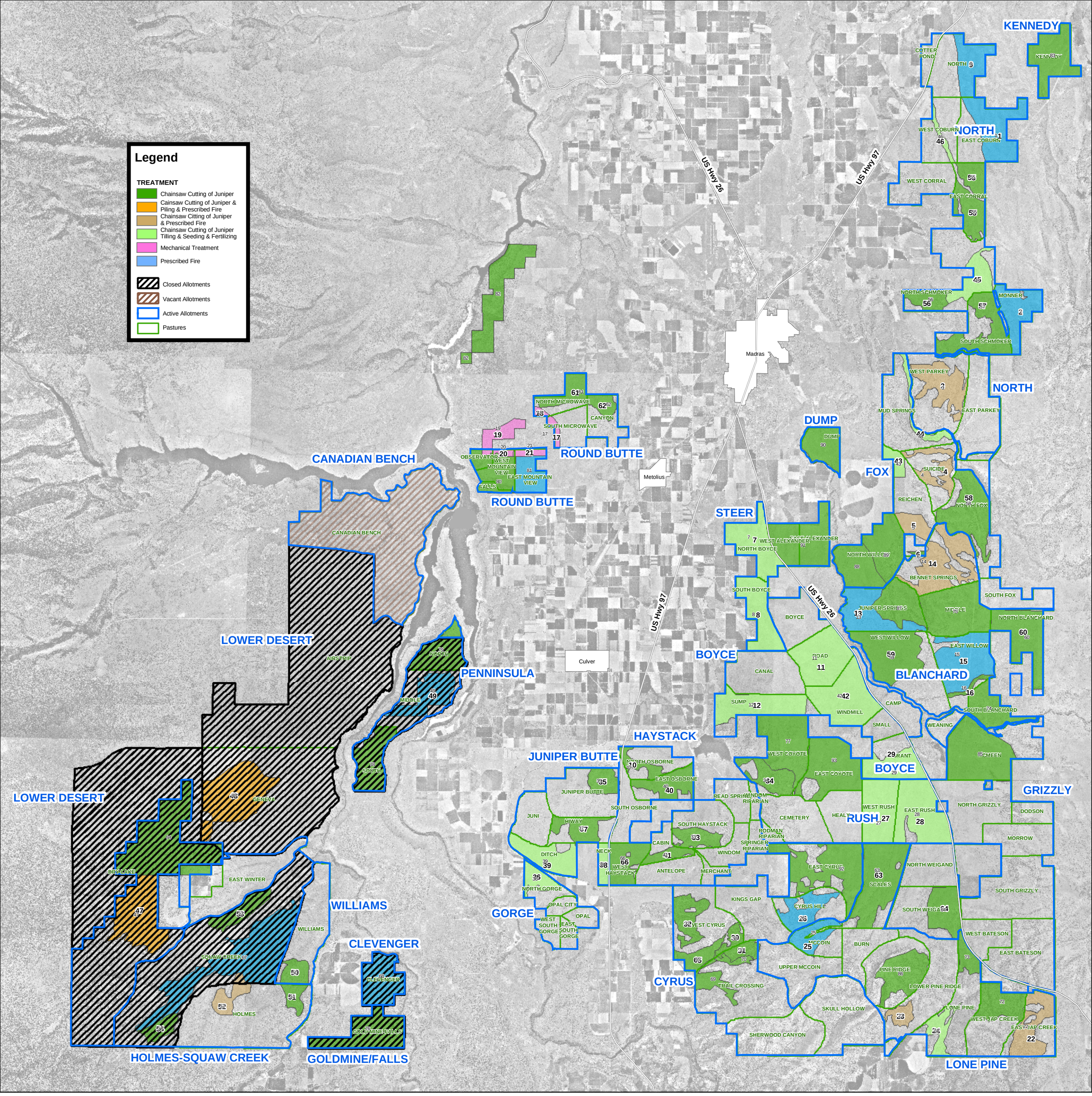

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ROD - Map 1 Alternative C Modified

CROOKED RIVER NATIONAL GRASSLAND

0 1 2 4 Miles

N W E S

09/11/2004
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