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Gerber - Willow Valley Watershed Analysis

BLM/OR/WA/PL-03/033+1792

Cover photograph by Jannice Cutler (June 1996) shows Big Adobe Reservoir with Yainax Butte in the background.

INTRODUCTION

Watershed analysis is a process of characterizing the human, aquatic, riparian, and terrestrial features, and their associated conditions, processes, and interactions (collectively referred to as "ecosystem elements") within a watershed. This provides a structured way to organize and understand ecosystem information. It enhances our ability to estimate direct, indirect, and cumulative effects of our management activities and guides the general type, location, and sequence of appropriate management activities within a watershed.

Watershed analysis is not a decision making process. Rather it is a "stage-setting" process. It helps us to understand the distribution, interaction, and behavior of a watershed's physical and biological resources. The results of watershed analyses establish the context for subsequent decision-making processes, including planning, project development, and regulatory compliance.

This analysis has been conducted by a team of Journey-level resource specialists from the Bureau of Land Management Klamath Falls Resource Area and the Fremont-Winema and Modoc National Forests. The team members consisted of Managers, Foresters, GIS Specialists, Archeologists, Range Conservationists, Silviculturists, Wildlife Biologists, Fisheries Biologists, Hydrologists, Botanists, Planners, Engineers, Soils Scientists, Fire Ecologists, and Ecologists. The team followed a standard, interagency, six-step process outlined in the Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis.
The steps followed by the team for this process are:

STEP 1 - CHARACTERIZATION OF THE WATERSHED
This step provides a summary of the dominant conditions and interactions within the watershed.

STEP 2 - IDENTIFICATION OF ISSUES AND KEY QUESTIONS
Issues and key questions were developed collaboratively through the Coordinated Resource Management Planning (CRMP) process with representatives of other public agencies and members of the Gerber CRMP Group.

STEP 3 - DESCRIPTION OF CURRENT CONDITIONS
This step provides a compilation of the most detailed and current resource information available for the analysis area.

STEP 4 - DESCRIPTION OF REFERENCE CONDITIONS
In general, this step describes the historic (or reference) conditions prior to the influence of European settlement. Quantitative data describing historical conditions for most parameters are generally not available for most resources. Therefore, the "Reference Conditions" step of this analysis focuses on "desired condition" for most resources, based on what anecdotal information was available and the professional opinion of the resource specialists.

STEP 5 - SYNTHESIS AND INTERPRETATION
This step provides a comparison of current and reference conditions including discussion of similarities, differences, causes, trends, and management implications.

STEP 6 - MANAGEMENT RECOMMENDATIONS
This step provides recommendations based on the analysis presented in the previous five steps, identifies monitoring activities that are needed in association with these recommendations, and documents data gaps and limitations of the analysis. Recommendations are designed to identify management activities which address differences between current and reference conditions where there is a need to provide restoration, maintenance, or protection of ecosystem components in order to sustain the health and productivity of natural resources.

This six-step process is the method used by federal agencies in the Pacific Northwest and focuses on watershed-specific conditions, issues, values, and uses that exist on the landscape. It is one of the principal analyses for implementing the Aquatic Conservation Strategy (ACS) set forth in the Northwest Forest Plan (Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA, USDI 1994)). It provides the watershed context for fishery protection, restoration, and enhancement efforts.

The Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington and related policy and guidance recommend that Rangeland Health Standards Assessments (RHSA's) for BLM grazing allotments be completed concurrently with watershed analysis when practical (USDI – BLM, 1997). Consequently this document serves as the analytical portion of the RHSA's for eight BLM allotments within the analysis area. A separate Rangeland Health Determination for these eight allotments was prepared, a copy of which is included as Appendix C.

Though the analysis area is not within the range of the Northern Spotted Owl, The Klamath Falls Resource Area Resource Management Plan (USDI – BLM, 1994) prescribes that the entire Resource Area will be managed for ACS objectives. Additionally, the National Forest Management Act of 1975, the Federal Land Policy and Management Act of 1976, and the Fremont National Forest Land and Resource Management Plan of 1989 define goals, objectives, standards and guidelines for the management of public lands. Watershed Analysis allows the refinement of those goals, objectives, standards, and guidelines to fit the physical and biological environment of the Gerber / Willow Valley Watershed Assessment Study Area.

What it does for me: (Private landowner & Agency)

- Enhances ability to estimate direct, indirect, and cumulative effects of our management activities *before* implementation.

- Can help guide the general type, location, and sequence of appropriate management activities within a watershed.

- Can assist in developing ecologically sustainable programs to produce water, timber, recreation, and other commodities.

- Facilitates program and budget development by identifying and setting priorities for social, economic, and ecological needs within and among watersheds.

- Establishes a consistent watershed-wide context for:
  - Project level NEPA analyses
  - Development of management goals and project objectives (i.e. Management plans).
  - Evaluation of management activities and project consistency given existing plan objectives.
  - Implementation of the Endangered Species Act (Section 7) including conferencing and consulting.
  - Water quality improvement efforts, and for the protection of beneficial uses identified by states, tribes, and other users in their water quality standards under the Federal Clean Water Act.
  - Identification and prioritization of watershed restoration needs.
  - Development of a monitoring plan that is responsive to the watershed processes of concern.

This document is organized by the six steps and core topics of the aforementioned guide. Thus it is often necessary for the reader to move from one step to the next in order to gain the complete "story" for a given core topic. There is also a difference in the basic unit of analysis between different core topics. For instance the minimum or basic unit of analysis for grazing is the allotment and pasture, whereas for hydrology, the basic unit is the subshed (6^{th} field watershed). Other core topics may be broken down no further than the 5^{th}

field watershed or may be analyzed for the entire study area based on what makes sense for that particular core topic.

The Gerber / Willow Valley Watershed Analysis study area encompasses almost 282,000 acres. The Bureau of Land Management Klamath Falls Resource Area manages approximately 110,138 acres, 71, 366 are managed by the Fremont National Forest, and 28,732 by the Modoc National Forest, with the remainder being State of Oregon and Private. The study area stretches from Bly Ridge in the north to Clear Lake in the south, and from Barnes Rim in the east to Langell Valley in the west. Elevation in the study area ranges from 4120' to 7213', averaging 5080'.

The study area is composed of two fifth field watersheds and some adjacent BLM lands. The Adjacent BLM lands were included in this analysis because their resources are similar to those occurring within the Gerber and Willow Valley watersheds, and they occur in a watershed (Lost River) that may not be analyzed in a watershed analysis in the near future. The BLM is actively performing management actions in the area, and not having been analyzed in a watershed analysis would inhibit achievement of ACS objectives, and interfere with the other benefits of the process outlined above.

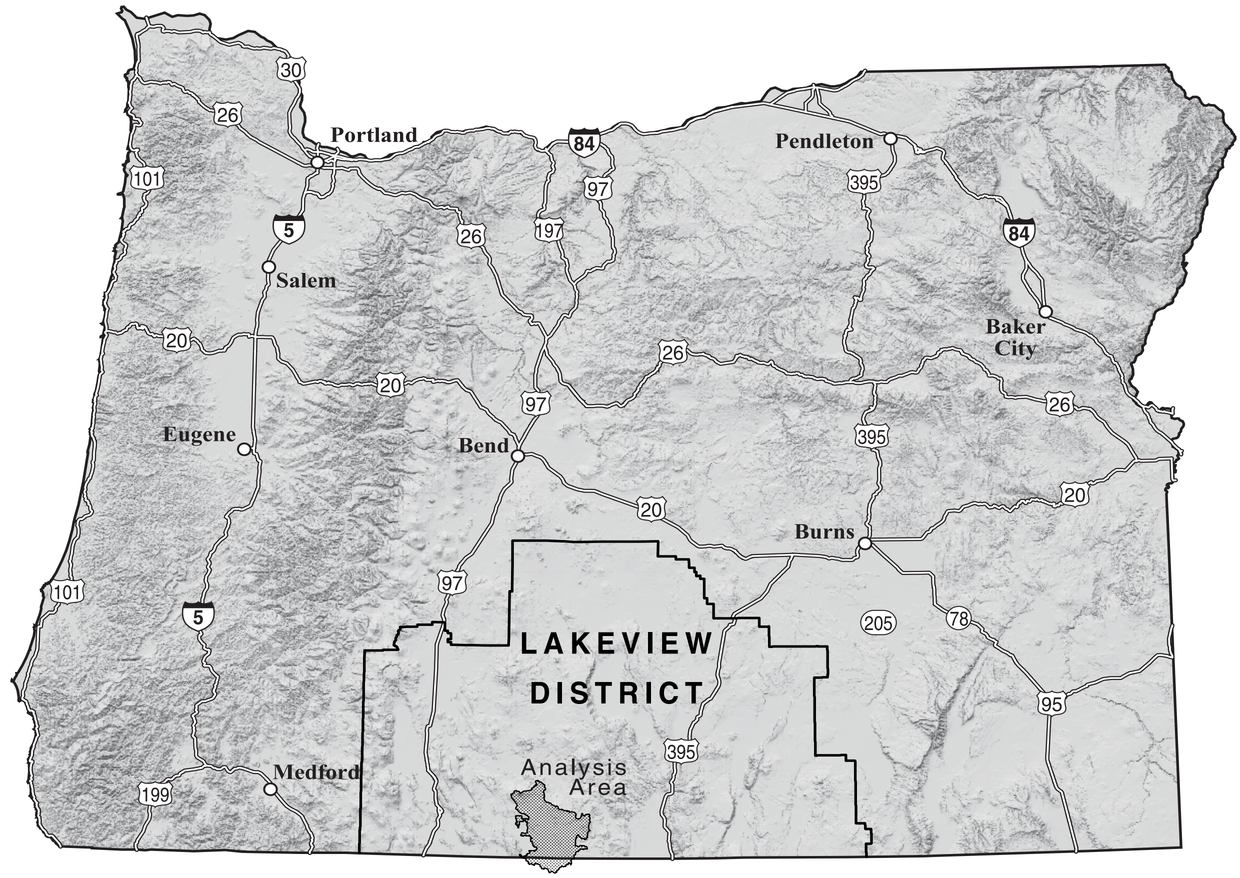
The two adjacent BLM administered areas are Lorella and Woolen Canyon. Lorella, the northern area, is approximately 4300 acres. The southern area, Woolen Canyon, is about 8700 acres. The Gerber 5th field watershed is composed of ten smaller (6th field) watersheds sometimes referred to as "subsheds". They include; Barnes Valley Creek, Ben Hall Creek, Buckmaster Creek, Dry Prairie, East Gerber Frontal, West Gerber Frontal, Horse Canyon Creek, Long Branch Creek, Miller Creek, and Pitchlog Creek. The Willow Valley (Upper Lost River) 5th field watershed contains four subsheds; Antelope Creek, Rock Creek, Upper Lost River, and Willow Valley.

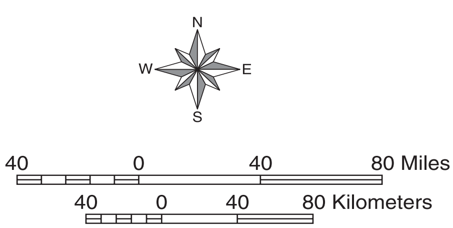
Most of the major topographic features occur along the divides and rims between the Gerber and Willow Valley watersheds, and adjacent watersheds. Topographic features vary between uplifted plateaus, table lands, high ridges, mountains, broad drainages, deep canyons, and shallow lake beds. The vegetation types present in the analysis area range from stream edges vegetated with willows, small pockets of aspen, and other deciduous shrubs, dry and wet meadow, grassland/shrub non-forested uplands, juniper woodlands, ponderosa pine, and mixed conifer.

The analysis area lies within the Klamath Basin Province. The geomorphology of the area is characterized by north to northwest trending faults, and volcanic plateaus. The parent material is mostly 1 to 11 million year old Mafic Basalt, which cooled slowly resulting in fine-grained rock. The area is interspersed with basaltic eruptive centers including basaltic or rhyolite flows, cinder cones and volcanic broken rock (Pankey Lakes, Paddock Butte, Rock Creek, and Brady Butte). Recent Alluvium exists in the lower basins and drainages, consisting of fine to coarse grain sediment derived from volcanic rock.

The study area is in the High Plateau and South-Central Climate Zones with warm dry summers and cold wet winters, as a result of being in the rain shadow of the Cascade Mountains. Most precipitation falls in the winter as snow with a second peak in late spring and early summer. Precipitation ranges between 13 and 30 inches depending on elevation and aspect. The average annual precipitation between 1925 and 2000 at Gerber Reservoir is 18.63". The diurnal variation in temperature ranges from 20 degrees in January to 40 in July. The growing season varies between 60 and 125 days.

This document represents the current understanding of the conditions, processes, interactions, and issues of concern occurring within the Gerber / Willow Valley Watershed Analysis Area. Prior to implementation any actions or projects, which utilize the information presented in this Watershed Analysis, will be analyzed on a site-specific basis by an interdisciplinary team and will include both public involvement and disclosure of decision as prescribed by the National Environmental Policy Act (NEPA).





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U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
LAKEVIEW DISTRICT

U.S DEPARTMENT OF AGRICULTURE
Forest Service
BLY RANGER DISTRICT

Gerber-Willow Valley
Watershed Assessment
2003

General Location

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STEP 1 - CHARACTERIZATION OF THE WATERSHED

The Gerber and Willow Valley Watersheds are located in the southeast portion of the Klamath Falls Resource Area (Lakeview District, BLM) and include portions of the Bly and Lakeview Ranger Districts on the Fremont-Winema National Forests and the Doublehead Ranger District on the Modoc National Forest. (Refer to Map 1.1 - Land Status, in Appendix E.)

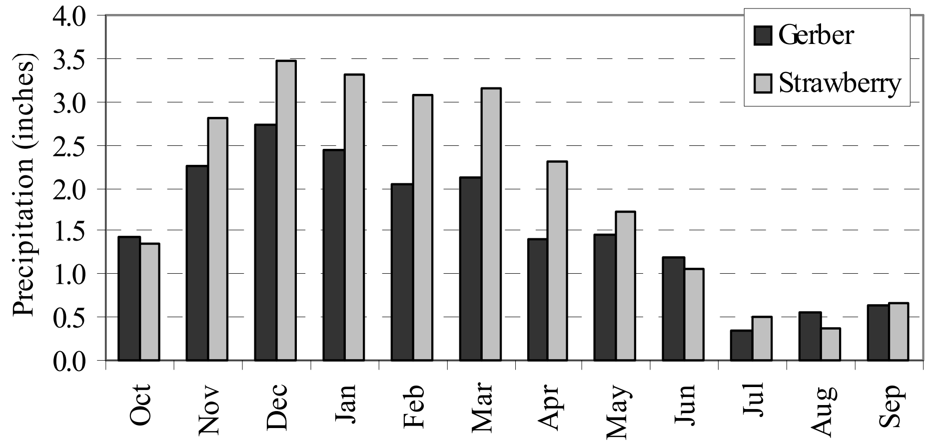
Elevations in the analysis area range from 4,300 feet in southern Langell Valley to 7,200 feet at Yainax Butte. Most of the Gerber Watershed is between the elevations of 5,000 to 5,500 feet while most of the Willow Valley Watershed is below 5,000 feet. Precipitation in the analysis area increases from west to east and from low elevations to higher elevations. Precipitation amounts range between 14 to 30 inches annually, the majority of which falls as snow. Most of the runoff from the Gerber Watershed comes from Ben Hall Creek and Barnes Valley Creek, with smaller amounts coming from Barnes Creek and Wildhorse Creek. In the Willow Valley Watershed the East Branch of the Lost River and Rock Creek are the main tributaries. The general information provided below is supplemented in more detail in Step 3.

I. Watershed and Aquatics

<u>Climate</u>

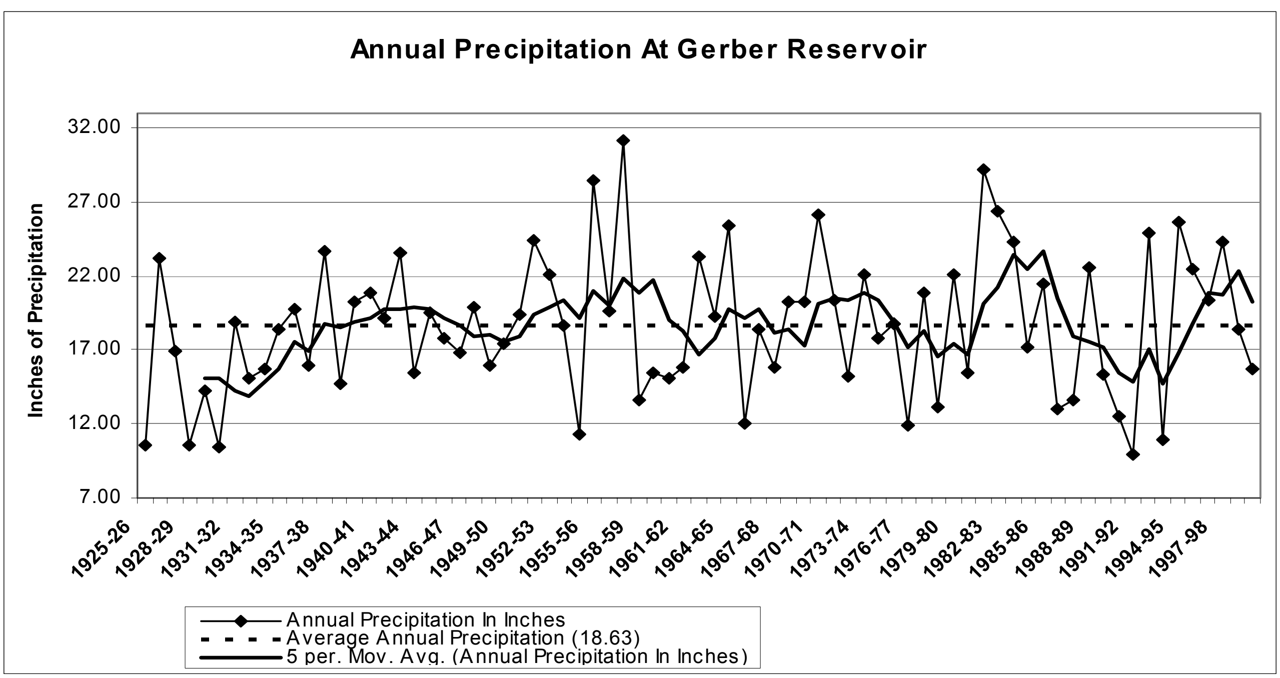
Much of the Gerber watershed is located within the High Plateau Climate Zone. The Willow Valley watershed and some of the extreme western portion of the Gerber watershed is within the South-Central Climate Zone.
The National Oceanic and Atmospheric Administration defines the High Plateau and South-Central Climate Zones as a relatively dry region of Oregon, in the “rain shadow” of the Southern Oregon Cascades. (Refer to discussion of Level III ecoregion class in the following “*Uplands/Soils*” section.) The High Plateau has cool temperatures and can receive significant snowfall. Daily low temperatures are, on average, above 32 degrees F for only two months out of the year, resulting in very short growing seasons. The South-Central Climate Zone is warmer and drier, with a growing season that usually does not exceed 90 days. Temperature swings between day and night are about 20 degrees F during winter months and up to 40 degrees F during summer months. These fluctuations affect snowmelt and soil freeze-thaw processes. Most precipitation occurs as snowfall during mild intensity storms, with a second maximum occurring in the late spring and early summer (Figure 1-1). This second maximum is more pronounced in the eastern sections of these watersheds, and is the cue that prompts the growing season. Average annual precipitation in these watersheds is highest on Yainax Butte (30 inches), and is lowest near Willow Valley Reservoir (14 inches).

Figure 1-1. Average monthly precipitation in the analysis area, as measured at NRCS and National Weather Service climate stations.



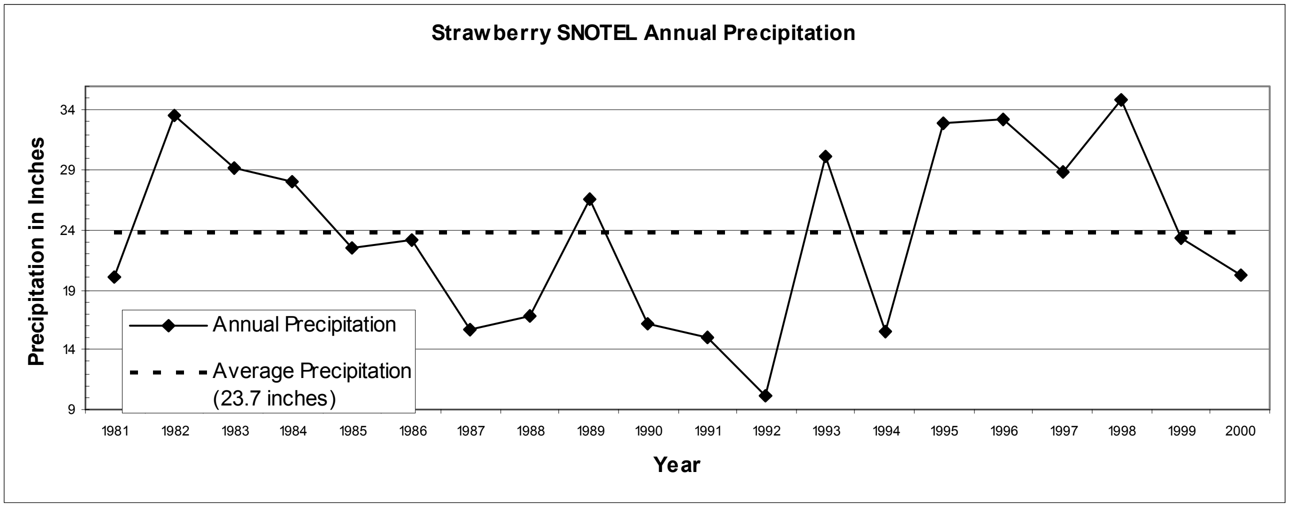
Average annual precipitation at Gerber Reservoir for the period of record (1925 to 2000) is 18.63 inches (Figure 1-2). Average annual precipitation from 1971 to 2000 is slightly higher (18.84 inches). There is a 5 to 10 year pattern of wet to dry years at Gerber. The most pronounced have been since the early 1980's when large swings in precipitation amounts begin to occur. This is likely due to the increased frequency of El Nino and La Nina episodes.

Figure 1-2: Annual precipitation at the Gerber climate station with five-year moving average.



Between 1981 and 2000 the Strawberry Snow Telemetry (SNOTEL) site had an average annual precipitation of 23.7 inches (Figure 1-3). Annual precipitation at Strawberry has followed a pattern similar to that recorded at Gerber, with the early- to mid-1980s wet, the late-1980s to the early-1990s dry, and the mid- and late-1990s relatively wet. Following the cyclic wet/dry pattern observed at these sites over the past 75 years, the dry cycle continued through 2001 and 2002.

Figure 1-3: Annual Precipitation at Strawberry Reservoir for the Period of Record



Uplands/Soils

An Order 3 Soil survey has been completed for the Gerber Block. Much of the information regarding soils for this watershed analysis is taken from the BLM *Interim Soil Survey Report of the Gerber Block* (Leet, 2001). The past and present climatic conditions in the survey area, particularly moisture and temperature, have greatly influenced soil formation controlling chemical and physical reactions taking place in soils. Water dissolves soluble material in soils, and it transports material from one part of a soil to another and is necessary for the growth of plants and other organisms that contribute organic matter to soils. Temperature affects the rate of chemical reactions and of physical breakdown caused by the freezing and thawing of water, which causes expansion and contraction and influences the movement of soil particles and rock fragments. The kind and amount of living organisms in and on a soil determine the kind and amount of organic matter added to the soil. The rate of decomposition of organic matter is controlled by temperature and moisture. When soils are moist and warm, weathering and organic matter decomposition can occur. When they are dry or cold, reactions are slow and chemical weathering may cease. Soil moisture and temperature vary greatly within the survey area because of the differences in the landscape.

Gerber's drainage occurs in the Eastern Cascade Slope and Foothill Level III Ecoregion which is the driest of the seven Level III Ecoregions in Western Washington and Oregon (Pater et al, 1998). It is a semiarid climate that grades from the wet climate to the west and the arid climate to the east. The soils are cold in winter, yet warm in summer. Soil temperatures conducive to chemical reactions are present from about March through November at the lower elevations and from May through October at the higher elevations (Soil Survey Staff, 2002). Gerber's land area is dominated by basalt, andesite, and tuff geologic materials, which release shrink-swell clays as they weather to soils. The soils have cobblestone and gravel stone clay loam surface layers. The region supports open forest and rangelands adapted to a prevailing dry climate and in a terrain susceptible to wildfire, an inter-fingering mosaic of the 9j and 9g Level IV ecoregion map units. Map unit 9j is the Klamath Juniper / Ponderosa Pine Woodland, which has a terrain of undulating hills and plateaus that form a mosaic of pastures and woodlands dominated by juniper. The adjacent map unit 9g is the Klamath /Goose Lake Warm Wet Basins, which has pluvial lakes and wetlands surrounded by sagebrush and bunchgrasses. (Refer to Map 1.2 – Ecoregions, in Appendix E.)

For erosion estimates, ecoregion map units 9j and 9g were divided by slope and vegetation into 4 erosion areas. Erosion was estimated with Water Erosion Prediction Project (WEPP, 2001) technology bases on Green and Amp infiltration for the forest and rangeland vegetation. Erosion and sediment transport to Gerber reservoir is apt to be minimal with mild Pacific storm intensities, gentle slopes, and depositional pluvial lake basins. Risk of erosion events should be low, except for the elevated risk from high intensity burns in closed forests, severe bank erosion, or rapid snowmelt events.

Hydrologic Conditions

There is very limited information on the streamflow conditions in both of the watersheds. The best hydrologic records are from the Gerber Reservoir inflow record (Figure 1-4). Annual reservoir inflow is closely correlated with fall and winter precipitation. The highest monthly inflow volumes are typically recorded following rain-on-snow events such as occurred in 1956 and 1964.

In order to fill the reservoir, almost all inflow is impounded from October through March. (Approximately 2 cfs is released to prevent freezing of the dam.) However, during years with unusually high snowpack water is released for flood management purposes. Average monthly Gerber Reservoir inflows range from a high of 17,000 acre-feet in March to a low of 211 acre-feet in August. The yearly average inflow is 57,000 acre-feet, from a drainage area of approximately 234 square miles. Flows in streams that contribute to Gerber Reservoir rise in response to mid-winter rain storms and spring snowmelt and then remain low from late spring through fall. Figure 1-5 shows data from USBR Klamath Basin Area Office, converted from average monthly inflows (thousands of acre feet) to average instantaneous discharge (cubic feet per second).

Figure 1-4: Average annual inflow into Gerber Reservoir.

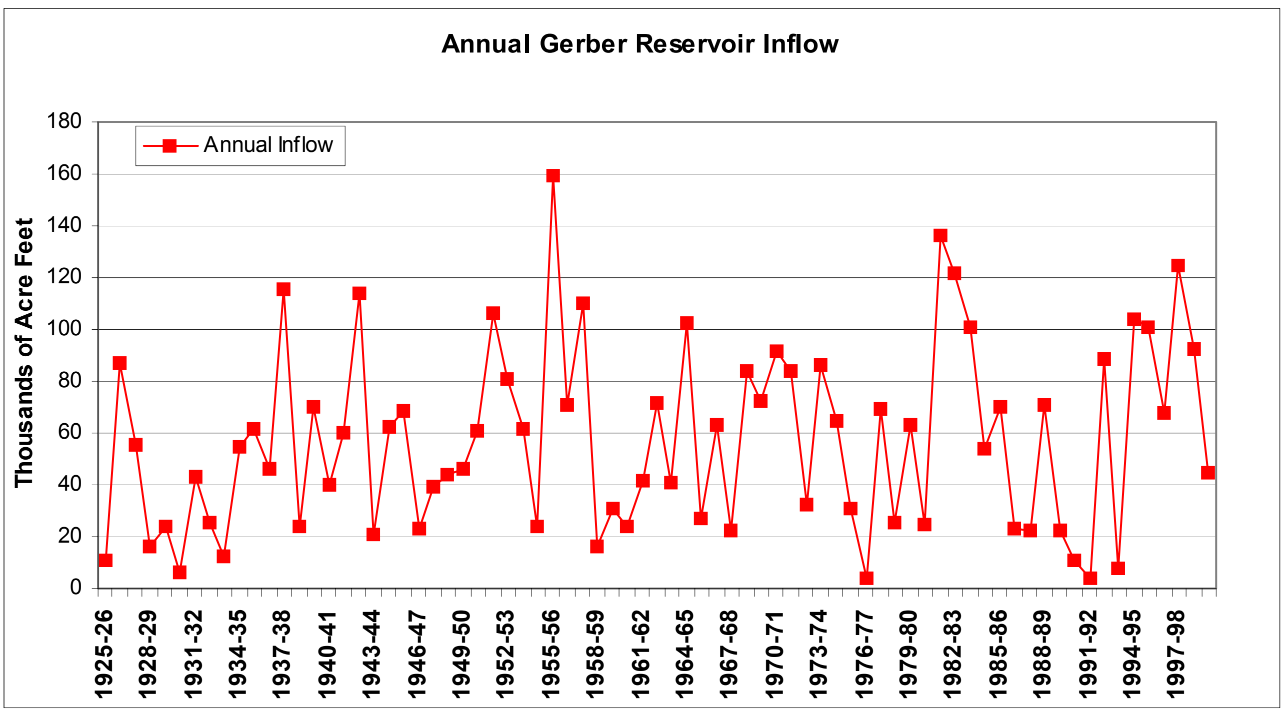


Figure 1-5. Average inflow into Gerber Reservoir for water years 1926 through 2000.

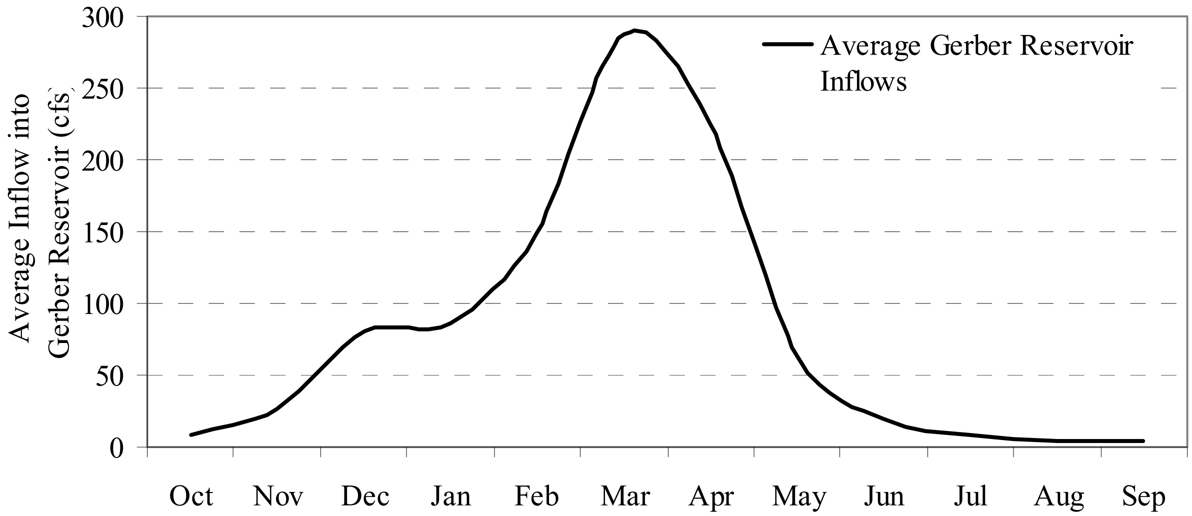
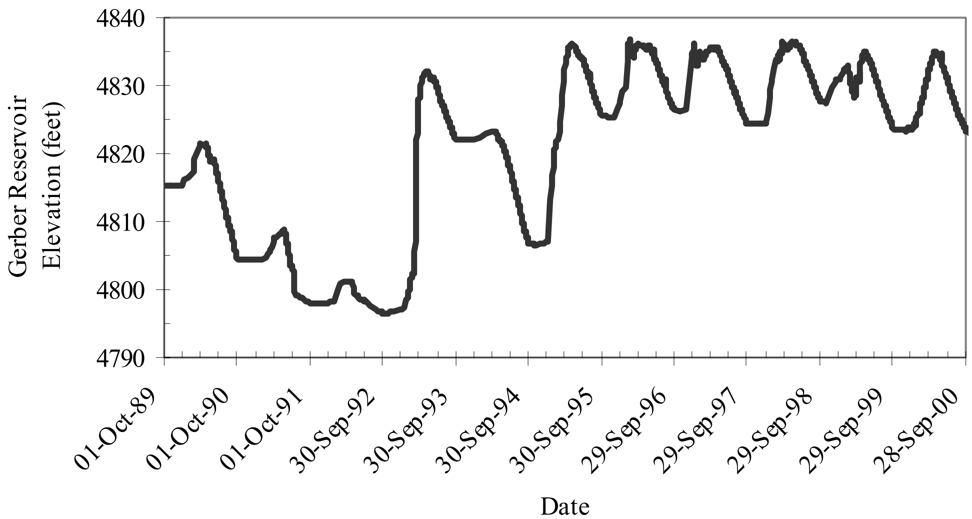


Table 1-1 shows a more detailed explanation of inflow into Gerber Reservoir. This streamflow pattern, in combination with the pattern of reservoir releases, accounts for the annual cycle of rising and falling water surface elevations in the reservoir (See Figure 1-5. Data from USBR Klamath Basin Area Office).

Table 1-1: Inflow into Gerber Reservoir (in Thousands of Acre Feet)

Month	Average Inflow	Maximum Inflow	(Year)	Minimum Inflow	(Year)
October	0.53	13.90	(1969)	0.00	(1936, 1997, 1999)
November	1.60	13.40	(1981)	0.00	(1936)
December	4.79	46.23	(1964)	0.03	(1931, 1989)
January	5.13	36.60	(1970)	0.00	(1985)
February	8.83	51.50	(1985)	0.07	(1932)
March	17.07	64.28	(1993)	0.57	(1992)
April	13.38	68.95	(1952)	0.16	(1931)
May	3.69	28.30	(1998)	0.01	(1991)
June	1.12	9.34	(1998)	0.00	(1999, 2000)
July	0.46	4.51	(1986)	0.00	(Many)
August	0.21	1.14	(1976)	0.00	(Many)
September	0.24	2.10	(1980)	0.00	(Many)

Figure 1-6. Example of annual cycles of surface elevations in Gerber Reservoir.



Stream Channels

There are hundreds of miles of streams in the analysis area. These streams exhibit great variability in flow patterns, channel form, and resource values and concerns. A large proportion of the drainage network is comprised of small streams that are ephemeral or intermittent. Even in the larger streams, perennial flow is often due to springs (or reservoir operations). Streams in the area flow though rocky canyons, narrow meadows, or wide wet meadows, and the shapes of stream channels vary as a result. Values associated with streams include riparian areas, water quality, and fish and aquatic habitat.

Riparian Vegetation

Riparian areas are wetland ecosystems that have a high water table because of proximity to areas that have an aquatic ecosystem or subsurface water. Riparian ecosystems generally occur as an ecotone between aquatic and upland ecosystems, but they have distinct vegetative and soil characteristics. Riparian areas are uniquely characterized by high diversity, density, and productivity of species. The vegetation in riparian areas provides shade and traps sediment before it reaches stream channels, thus helping to maintain a supply of cool, clean water.

Wetlands and riparian areas are deposition lands. They have characteristic fluvial deposits, soil biology and vegetation associated with seasonal flooding and saturation (Leopold et al, 1964, Mitsch and Gosselink, 1993, Weixelman et al., 1999). Wetlands habitats and their riparian extensions along stream and lake margins are shaped by stream flow patterns and sediment supply. In turn, vegetation roughness, affects sediment retention and fluvial landforms. Riparian habitats are shaped by dynamic feedback mechanism between sediment deposited and sediment eroded. If the sediment supply in and out is balanced, then the landforms shaped by a stream are “at grade.” At grade, deposition is on bars and sediment removal is from meander cut banks. There is also sequential accumulation of finer “silts” over the coarser bar “gravels” for a two-tier coarse bed and fine bank deposits (Leopold et al., 1964). Riparian and wetland habitats in the Gerber/Willow Valley area show the influences of a semiarid climate, resistant bedrock, low relief, and clay soils.

Habitat for Aquatic Species

Parameters for this analysis were chosen based their importance as potential limiting factors for the species of concern (namely redband trout and Klamath sucker species) in the watershed. Redband trout was selected because it has the most stringent water quality, habitat complexity, and substrate requirements of the fish in the Gerber/ Willow Valley analysis area. Shortnose suckers were chosen because of the important management implications related to Endangered Species Act (ESA) requirements.

Selected Habitat Parameters include:

- Fish passage and distribution
- Stream temperature
- Spawning habitat
- Habitat complexity (amount of large woody debris and number of pools per mile)
- Exotic Species distribution and abundance

Shortnose Suckers and Klamath Largescale suckers

The shortnose and Lost River suckers were listed as endangered in 1988 under the Endangered Species Act (USDI-FWS. 1988). Both species inhabit lakes and streams in the Klamath Basin and were once abundant in the Lost River watershed, Upper Klamath Lake, and its tributaries. Gerber Reservoir and its watershed is identified as unit 6 in the proposed critical habitat for shortnose sucker and is the only major habitat area inhabited by shortnose suckers but not Lost River suckers (USDI-FWS. 1994). Proposed critical habitat includes the waters of Gerber Reservoir below the high water line and a large portion of the Ben Hall, Barnes, Barnes Valley, Pitchlog, and Wildhorse Creek watersheds. In addition, juvenile suckers have been found in Long Branch Creek, and Lapham Creek a tributary of Barnes Valley Creek on Forest Service administered lands (USDI-FWS. 1995)

Klamath Redband trout

Redband trout, a state sensitive species in the Lost River drainage, are limited to a few small, scattered populations that are largely limited by restricted habitats (ODFW 1997). Perennial streams interrupted by dry reaches above Gerber Reservoir support spawning populations that rear in the reservoir. Cold water, spring-fed tributaries provide some refugial habitat during dry months. Miller Creek, downstream from Gerber Reservoir periodically supports a population of redband trout.

II. Vegetation

Table 1-2 below provides a rough estimate (derived from ISODATA classification of satellite imagery) of the number of acres by plant community for each subwatershed.

Table 1-2: Acres of Plant Communities by Subwatershed.

Sub Watershed	Riparian	Shrub	Grass	Juniper	Conifer	Pine	Regen*	Total
Ben Hall Creek	149	950	185	504	529	6571	2224	11,112
Buckmaster Creek	217	376	152	339	485	3227	704	5500
West Gerber Frontal	1588	5348	20	4418	469	3730	133	15,706
Long Branch Creek	377	5542	71	2554	916	4784	677	14,921
East Gerber Frontal	229	5086	53	4452	4813	4247	367	19,247
Barnes Valley Creek	1956	9724	343	5628	778	9913	0	28,342
Pitch Log Creek	114	6853	121	2406	515	4882	0	14,891
Rock Creek	919	10,989	111	11,001	692	7920	0	31,632
Horse Canyon Creek	339	2927	698	1021	1969	7579	3208	17,741
Dry Prairie	720	10,174	37	4236	364	5229	216	20,976
Miller Creek	2039	6351	220	14,048	139	3410	37	26,244
Lorella	0	180	0	2212	0	436	0	2828
Antelope Creek	907	10,518	124	11,951	208	3308	0	27,016
Woolen Canyon	14	2000	0	6611	0	65	0	8690
Willow Valley Reservoir	38	3338	6	13,089	0	60	6	16,537
Upper Lost River Frontal	64	5570	53	9416	23	1485	0	16,611
Total in Analysis Area	9670	85,926	2194	93,886	11,900	66,846	7572	277,994

(*Reneration of conifers)

Forested Uplands

Forest Vegetation (including Juniper) covers approximately 176,500 acres in the Gerber/Willow Valley WA area, or 63% of the total area. The major forest community types are ponderosa pine, mixed conifer, lodgepole pine, and western juniper woodlands. (Juniper woodlands are further split into “natural” stands, where they would occur under natural conditions with periodic fire, and “invasive” stands, which have expanded from natural sites due to the exclusion of natural fire). These forest community types are shown on Map 1.3 (Appendix E). Table 1-3 below summarizes these types by landowner.

Table 1-3. Forest Community Type Acreage by Landowner.

Landowner	Ponderosa Pine	Mixed Conifer	Juniper	Total Forest Land
BLM	12,445	778	53,892	67,115
Fremont National Forest	29,396	3,531	12,243	45,170
Modoc National Forest	2,013	30	17,107	19,150
State of Oregon	797	196	46	1,039
Private	22,555	4,895	11,368	39,818
Total	67,206	9,429	94,655	172,292

Non-Forested Uplands

BLM Administered Lands

The non-forested upland vegetation in the analysis area is dominated by western juniper, low sagebrush, bitterbrush, mountain big sagebrush, Idaho fescue, single spike oatgrass, and a plethora of other shrubs, grasses, and forbs. During the 1997 and 1998 field seasons, an Ecological Site Inventory (ESI) was completed for the Gerber Block. This inventory classified the BLM lands (and most of the intermingled private) into an array of ecologically distinct vegetation communities. Over 110,500 acres of vegetation were classified during the ESI. On the BLM administered lands in the analysis area, there are approximately 83,500 acres of non-forested vegetation identified and classified. Non-forested, as defined in this section includes juniper potential vegetation types and will be addressed in this portion of the analysis throughout this document. Also classified were an additional 27,000 acres within several ponderosa pine ecological types. (The Forested Uplands section throughout this analysis will address pine sites.) The following Table 1-4 is a condensed summary of the ESI based vegetation information for BLM lands; more complete information is found in Steps 3, 4, and 5:

Table 1-4. Condensed summary of the ESI based vegetation information for BLM lands.

Vegetation Type (# of distinct ecological sites included)	Acres	Percent of surveyed area
Pine vegetation sites (3)	27,102	24.5%
Juniper vegetation sites (4)	45,342	41.0%
Big sagebrush sites (3)	1,909	1.7%
Low sagebrush sites (4)	32,361	29.3%
Mesic sites (3)	2,962	2.7%
Miscellaneous sites (3)	848	0.8%

USFS Administered Lands

Modoc National Forest - For the limited amount of Modoc NF lands in the analysis area, there is no vegetation information available that is specific only to the analysis area. There is, however, vegetation information for the two allotments that extend into the analysis area, but it is not possible to break out the information for only this watershed analysis area. The vegetation types are analogous to the BLM and Fremont NF lands listed above. See the Modoc NF portion Step 3 for more information on vegetation that is available.

Fremont National Forest - Most of the Fremont NF vegetation types are equivalent to the ecological sites described on the BLM lands. The following table is a summary of the vegetation types found on the Fremont NF lands immediately adjacent to the Gerber Block and within the analysis area.

Table 1-5. Non-forest Vegetation Types on the Fremont NF Adjacent to the Gerber Block

ECOLOGICAL CLASSIFICATION	ACRES
Juniper/Low Sagebrush/fescue	15,459
Low Sagebrush/Fescue-Squirreltail	24,757
Big Sagebrush/Bunchgrass	14
Sagebrush	17
Meadow (wet, moist, dry)	1517
Water	572
Rock	28
Aspen	11
Grasslands	38
Alpine Low Sagebrush/Red Fescue	3
Unknown	415

TOTAL	42,831

Noxious Weeds

(Refer to discussion in *Step 3 – Current Conditions*.)

Threatened, Endangered, and Sensitive Plant Species

(Refer to discussion in *Step 3 – Current Conditions*.)

III. Terrestrial Species and Habitat

The terrestrial wildlife species that inhabit the Gerber and Willow Valley watersheds include many of the species that are typically associated with various grass, riparian, shrub, juniper, pine, and fir habitats within the transition zone between the east slope of the Cascades and the Great Basin ecoregions. Some of these species have state and/or federal listing of varying degrees. Others have relatively small populations since the watersheds lie on the edges of their natural range. Refer to Appendix A for a summarization the wildlife species that are known or thought to occur within the Gerber and Willow Valley watersheds.

Threatened, Endangered and Sensitive Species

Species of Concern (SOC)

Bald Eagle - (Threatened, Proposed for De-listing) - Bald eagle activity has been documented in the Gerber and Willow Valley Watersheds. There are currently seven active nest sites on USFS and BLM land. Fourteen historic nest sites have been documented in the watersheds. Bald eagles are typically seen foraging at Gerber reservoir, Willow Valley reservoir, Antelope reservoir, Upper Midway reservoir, Tull Lake, Miller creek, and Barnes Valley creek. In these areas, roosting sites usually consist of large live or dead conifers.

American Peregrine Falcon - (R-6 Regional Forester's Sensitive Species List; recently De-listed from Endangered) - American peregrine falcons have been documented historically in the Gerber watershed. The Gerber and Willow Valley watersheds were surveyed for peregrine falcon nesting and roosting habitat in 1999 in response to the de-listing decision. One site in the Miller creek canyon below Gerber dam received a high potential rating and another nearby site received a medium potential rating for nest sites. Peregrine falcons were seen in the Gerber watershed in 1999.

Canada Lynx - (Federally Listed Threatened) - Canada lynx are federally listed as a threatened species in Oregon. This carnivore probably historically occurred in low numbers in the analysis area. Although localized prey base populations are likely healthy enough to support lynx, habitat type, condition, continuity, and overall prey base is not considered to be suitable for lynx. Therefore, Canada Lynx will not be discussed further in this document. Currently, formal carnivore surveys are being performed in the analysis area.

Northwestern Pond Turtle - (Federal Species of Concern; Bureau Assessment Species in Oregon) - The northwestern pond turtle is a federally designated Species of Concern (ONHP Feb. 2001). This aquatic turtle can be found in lakes, ponds, and along larger streams similar to those found in the analysis area. Currently in the Gerber watershed an inventory and population study of reptiles and amphibians is being conducted.

Sightings of pond turtles have been documented in the Gerber/Willow Valley Watershed, mostly along the main access road leading to Gerber Reservoir. However there appears to be little potential for northwestern pond turtle habitat in the watersheds. There is no current evidence of successful reproduction. Primarily the aquatic habitats would be near springs along major tributaries. Most of the streams in the watersheds are locked up as ice during the winter months and are completely dry in the summer providing very little sustained suitable habitat for this turtle species.

Bats – Although bats are known to occur in the Gerber and Willow Valley watersheds, formal surveys have not been completed. There are potentially nine bat species within the analysis area. The silver-haired bat, pallid bat, Yuma myotis, long-legged myotis and long-eared myotis are Federal Species of Concern and Bureau Tracking Species in Oregon (ONHP, 2001). Bats utilize structures, caves, snags and other suitable trees with cavities and/or loose bark for roosting and maternal colony sties. Suitable bat habitat is available to varying degrees within the analysis area.

Great Gray Owl - (BLM Survey and Manage Species, State Sensitive Vulnerable in Oregon) - Some of the USFS land within the Gerber watershed has been incidentally surveyed for owls. There have been great gray owls detected in the eastern and northeastern parts of the watershed. The BLM portion has not been formally surveyed. Great grays have been known to prefer large live or dead trees for nesting and open areas for foraging. There is potential great gray owl habitat in both watersheds.

Big Game

The Oregon Department of Fish and Wildlife (ODFW) designates Management Units for big game. The Gerber and Willow Valley watersheds include portions of both the Klamath Falls and the Interstate Management Units. These areas are managed for mule deer, Rocky Mountain elk, and pronghorn antelope. The area also contains populations of mountain lion and black bear. All hunting is by permit or by quota system, with the exception of the general eastern Oregon black bear season and the first season Rocky Mountain elk general hunt.

Terrestrial Species Associated with Late/Old Successional Forest Habitats

There are approximately 2258 acres of old-growth forest within the watersheds. This total includes areas dominated by ponderosa pine or considered mixed conifer forest. Old growth forest cover represents approximately 2.9% of the forested vegetation in ponderosa pine and mixed conifer stands within the watershed. Based on known changes on USFS land in old growth forest cover, it is assumed that Late/Old Successional (LOS) forest cover has declined since mid-century, and species composition has changed in pure ponderosa pine to a more mixed conifer forest. Little of this LOS forest cover is single-storied stands. In general, habitat for species associated with open, park-like single canopy LOS ponderosa pine stands has declined while multi-storied mixed conifer LOS habitats have increased. Within the last few decades, forested stands on the BLM portions of the watersheds have been managed for more LOS ponderosa pine characteristics. Other than the species discussed below, there are numerous wildlife species that utilize LOS forest habitats.

Northern Goshawk - Five goshawk nest sites have been historically identified within the watershed. Suitable nesting habitat for goshawks currently exists within the present LOS ponderosa pine habitat as well as in older mixed coniferous forest habitat. Overall habitat suitability and availability has declined with the decreases in LOS forest cover, conversion of LOS forest cover to multi-storied habitats, and increases in understory vegetation. However, these accipiters have been known to use multi-storied stands containing adequate flight corridors.

Pileated Woodpecker - There are no known active pileated woodpecker nest sites within the watersheds. However, these woodpeckers have been documented within the Gerber watershed. Suitable habitat exists within mixed conifer LOS stands. Overall, habitat suitability has increased where conversion of LOS ponderosa pine forest cover to LOS mixed conifer habitats has occurred.

American Marten - Recently, martens have been documented in the upper Gerber watershed. Other potential marten habitat exists in and adjacent to LOS forest habitat throughout the watershed. Both habitat availability and continuity have declined within the last 50 years. Habitat suitability however, may have increased in patches of LOS forest habitat.

Black-backed/white-headed woodpecker - Black-backed and white-headed woodpeckers have been formally documented within the watersheds. Although these woodpeckers are most commonly associated with LOS ponderosa pine and mixed conifer habitats, suitable habitat also exists within forest stands where insect activity has provided foraging opportunity and snag numbers are adequate. Availability, continuity, and suitability of habitat in some ponderosa pine and mixed conifer habitats have declined over the past 50 years, while availability and suitability have increased in some areas with increases in LOS forest cover.

LOS Landbirds - The golden-crowned kinglet, olive-sided flycatcher, pine siskin, pygmy nuthatch and Wlliamson's sapsucker have all been documented within the watersheds. They are known to prefer mature forest stands typical of LOS habitat for roosting, nesting and foraging (Partners-in-flight, 1998).

Terrestrial Species Associated with Sagebrush Steppe Habitat

The Gerber and Willow Valley watersheds contain many thousands of acres of sagebrush steppe habitat. A large percentage of this habitat type in dominated by low sagebrush, where as a small percentage is dominated by big sagebrush. Other components include antelope bitterbrush, mountain mahogany, grasses and an increasing amount of western juniper. Some terrestrial species of wildlife in the analysis area are considered sagebrush obligates, while others utilize these habitats only during certain times of the year.

Western Sage Grouse - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Western sage grouse historically inhabited suitable areas of the Gerber and Willow Valley watersheds. There are seven historic breeding areas or leks within the watersheds. None of these leks are currently considered occupied. Suitable habitat for sage grouse is found where relatively large, open areas of low and/or big sagebrush and wet meadows/ephemeral lakes occur.

Pygmy Rabbit - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Although the watersheds have not been extensively surveyed for pygmy rabbits to this date, it is likely that these rabbits occur within the analysis area. They have recently been documented outside the watersheds to the west on Bryant Mountain. Currently, plans to conduct pygmy rabbit surveys in the analysis area are being developed. Suitable habitat is thought to consist of big sagebrush dominated areas and associated deeper, relatively looser soil than adjacent areas.

Terrestrial Species Associated with Aspen/Riparian Habitat

Approximately 9670 acres of riparian and wet meadow habitat exists within the watersheds. Aspen stands tend to be relatively small and scattered throughout the analysis area where conditions are suitable. Aspen distribution is generally restricted to moist/wet sites associated with riparian areas, rock outcrops or seasonally wet areas. These stands seem to be tied to specific sites within other plant communities where moisture is sufficient and in drainages, riparian zones or depressions. Other than the species discussed below, there are numerous wildlife species in the analysis area that utilize aspen/riparian habitats exclusively or periodically during the year.

Red-naped/Red-breasted sapsucker - The red-naped and red-breasted sapsucker have not been formally surveyed for, but both have been documented within the analysis area. The preferred habitat of these birds (especially the red-naped) for foraging and nesting is LOS aspen stands. These types of aspen stands are distributed throughout the watershed, but in relatively small patches.

American Beaver - Evidence of beaver activity is present within the watersheds, though little distinction between historic and current activity has been made. Beavers flourish in riparian habitat along permanent waterways with a substantial aspen, willow, alder and/or cottonwood component. They have been known to use other woody vegetation for food and building materials when their preferred trees/shrubs are not available. Historically, beavers likely existed in certain parts of the analysis area.

Willow Flycatcher - The Willow Flycatcher has been formally documented within the analysis area. As its name implies, this bird is found in riparian areas typically with a healthy willow component. It forages mainly on insects and nests in shrubs and trees characteristic of riparian habitat. Suitable habitat exists in riparian areas located along most of the tributaries of Gerber and Willow Valley reservoir.

Other Terrestrial Species

Other terrestrial wildlife common to the Great Basin and east side of the Cascades are found in the analysis area. Bobcats, coyotes, rabbits, porcupines, red-tailed hawks, golden eagles, prairie falcons, ravens, kestrels, great-horned owls, amphibians, reptiles, neotropical landbirds, primary and secondary cavity nesters, and numerous other raptors, birds, and small mammals are all present within the watersheds. (See Appendix A.)

IV. Human Uses

Timber

(Refer to discussion in *Step 3 – Current Conditions*.)

Grazing

BLM Administered Lands

Within the Gerber Block, the total maximum number of cattle permitted is 2300 to 2400 head with an average season of use of about 3 months, though the latter varies by allotment from a few weeks to almost 5 months. The area is allocated into 18 different allotments with 16 different grazing permit holders. There is a total of 7,170 AUMs currently permitted in the analysis area, which is slightly more than half of the KFRA total.

USFS Administered Lands

Fremont National Forest - There are nine Forest Service allotments lying adjacent to the "Gerber Block" on the west, north, and east sides. Seven of these allotments are administered by the Bly Ranger District and 2 by the Lakeview Ranger District. These allotments have varying seasons-of-use, but are within the range of 6/1 to 9/30. The numbers of livestock (cattle) can range from 11 head to over 500 pair depending on the allotment.

Modoc National Forest - There are two Forest Service allotments of which small portions lie within the analysis area. The Clear Lake allotment is currently permitted for 750 head (cow/calf pairs) from 4/16-10/15. For the Warm Springs allotment, 350 cattle are permitted with the grazing season varying by year depending on the grazing plan, though it generally amounts to approximately 1300 animal unit months beginning 5/1 and ending 10/15. More specific information for the grazing use of all these lands is found in Step 3: *Human Uses - Grazing*.

Recreation

Within the Gerber/Willow Valley Watershed area are a variety of BLM developed campgrounds, more primitive campsites, and day use areas (no recreation sites are located within Forest Service lands). The two main Gerber campgrounds, located at Gerber Reservoir, contain approximately 45 campsites, with developed day use areas available for fishing, boating and picnicking. A total of eight primitive campsites (hunter camps) are scattered about the watershed (Gerber Potholes, Stan H. Spring, Miller Creek, Pitchlog Creek, Wildhorse, Basin Camp, Upper Midway and Rock Creek). Two primitive day use areas are located on Gerber Reservoir at Frog Camp (east of Gerber dam) and at Barnes Valley Creek boat ramp. A fully developed day use area with boat ramp is located at Willow Valley Reservoir.A number of smaller reservoirs in the watershed provide a variety of wildlife and waterfowl habitat. Approximately seven of these reservoirs are signed on the ground and mapped in the *Gerber Watchable Wildlife* brochure, a driving tour.

In addition, the watershed offers a variety of reservoirs that are stocked by Oregon Dept. of Fish and Wildlife for anglers (Gerber reservoir is not stocked due to concerns about impacts to endangered suckers). These reservoirs, along with other areas within the watershed, receive dispersed recreation use, primarily during the summer and fall months.

Cultural Resources

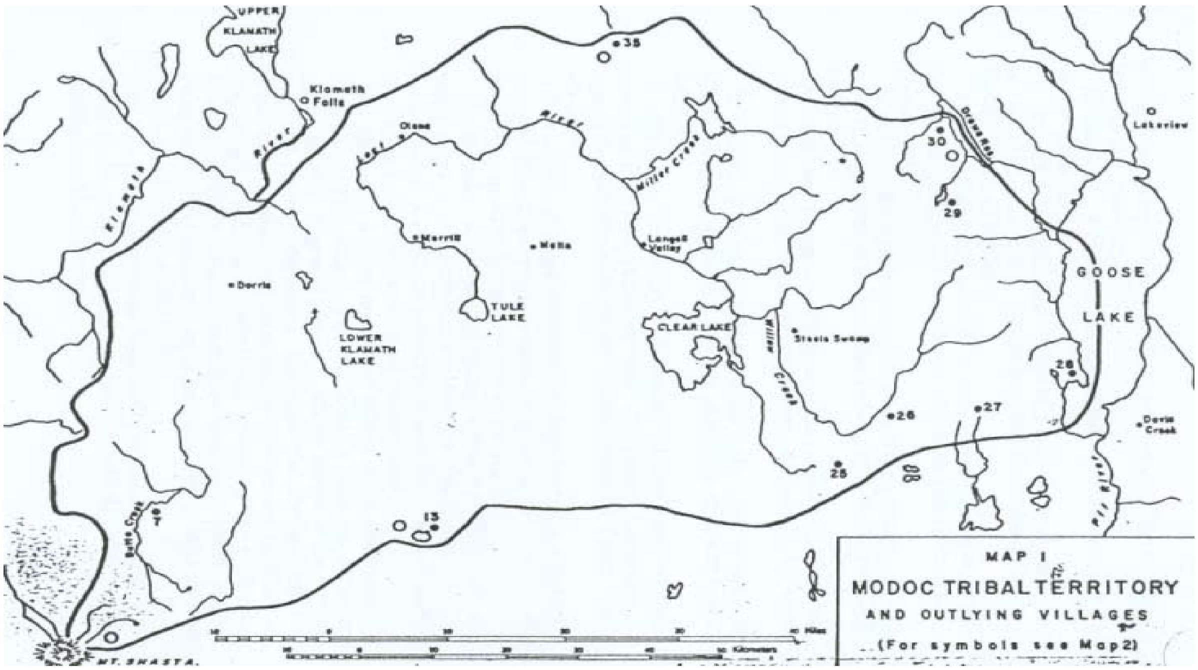
A brief examination of historical and research literature and oral histories indicate that humans have inhabited the Gerber/Willow Valley watershed area for thousands of years and the evidence of their occupation can be found throughout the landscape. The area is rich in both prehistoric (pre-1875) and historical archaeological material.

Prehistorically, the Modoc tribe inhabited the watershed analysis area (Figure 1-7). They, along with the Klamath and Yahooskin Band of Snake Indians, ceded the lands in and around the watershed to the United States in the Klamath Lake Treaty of 1864. Article I of the Klamath Lake Treaty established the Klamath Reservation.

In 1864, the reservation encompassed about 1.1 million acres. Identification of survey errors reduced the reservation to 862,622 acres by 1954. At this time, Congress passed the Termination Act (25 USCS-564) which suspended the Tribe's federal status, treaty rights, and reservation. Much of the reservation became the Winema National Forest and Klamath Wildlife Preserve in 1961 (Zucker et al. 1983).

However, termination did not end the Tribe's hunting, gathering, and fishing rights within the former reservation boundary (Final Consent Decree: Kimball v. Callahan, et al., civ.73-155 United States District Court for the District of Oregon, 1981; Zucker et al. 1983). Only 1025 acres of the Gerber/Willow Valley watershed analysis area lies within the former reservation lands (Figure 1-8). Under the Consent Decree the Klamath Tribes are allowed to hunt, fish, and gather without federal regulation. Lands outside of the reservation established by the 1864 treaty were exempt from the consent decree, thus treaty rights were not re-established in these areas. The Klamath Tribes federal status was restored in 1986 by an Act of Congress (Public Law 99-389).

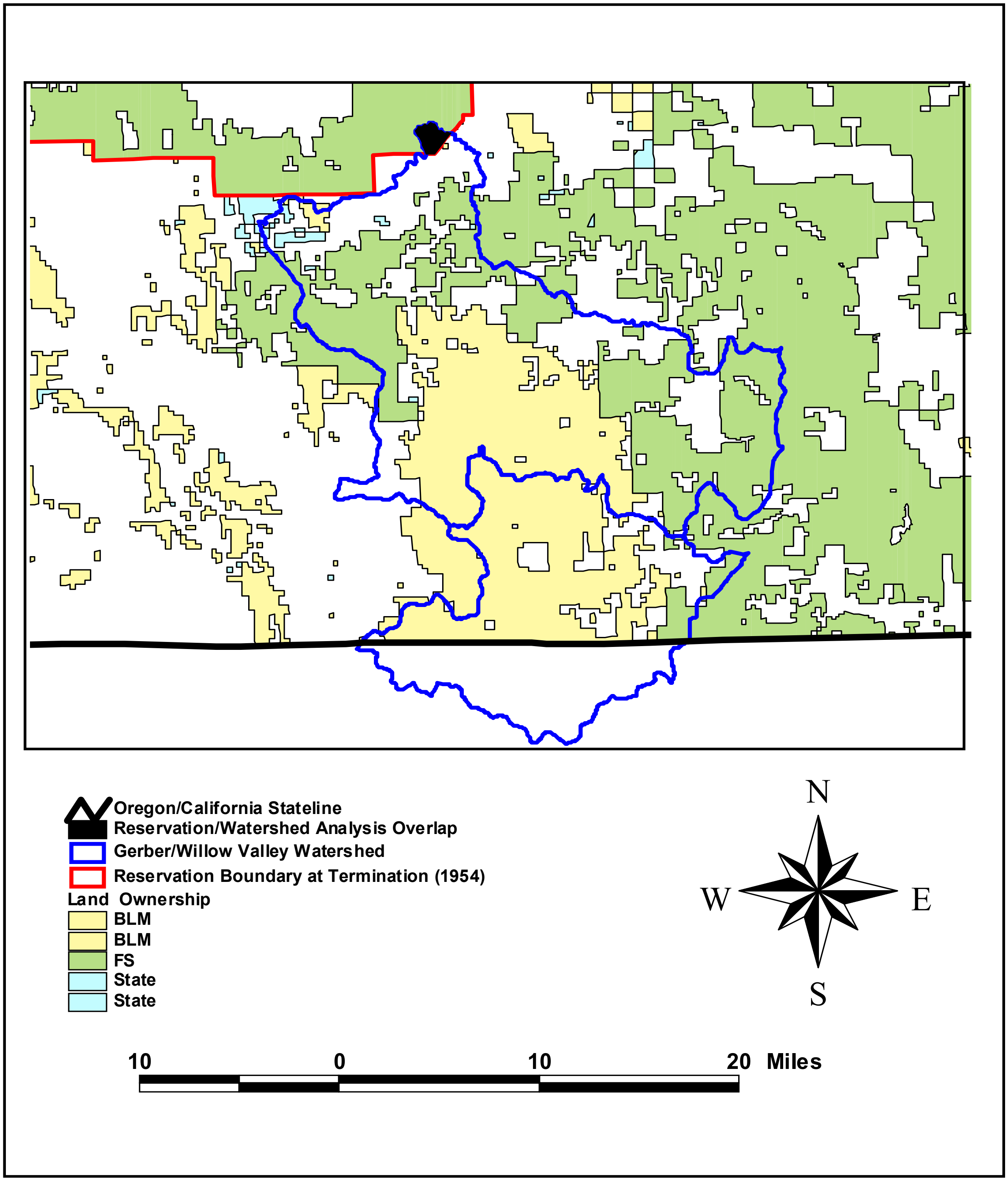
Figure 1-7. Modoc Tribal Territory (from Ray 1963).



A small portion on the northern edge of the Gerber/Willow Valley watershed (see Figure 1-8) lies within the "Area of Cultural Influence" of the Klamath Tribes (also referred to as "area Impacting the Tribes' Treaty Rights") as defined by the February 15, 1999 Memorandum of Agreement between the Klamath Tribes and the Fremont U.S. National Forest. The United States has a trust responsibility to protect the Klamath Tribes' treaty rights. Development and implementation of management activities within the former reservation lands has the potential to affect treaty rights.

Euro-Americans began to settle the area in 1875 (Beckham 2000:19, 26-29). The historic economy revolved around livestock grazing, thus the area was developed for ranching. The first grazing district in Oregon and the United States was established in the Gerber/Willow Valley area in 1934, under the 1933 Taylor Grazing Act. Major changes to the landscape occurred when the Bureau of Reclamation constructed the Gerber Dam on Miller Creek in 1925 for irrigation water storage, and the Civilian Conservation Corps (CCC) built roads, stock ponds, and fences in the 1930s.

Figure 1-8. Map of former Klamath Reservation in relation to Gerber/Willow Valley Watershed.



STEP 2. IDENTIFICATION OF ISSUES AND KEY QUESTIONS

Step 2 identifies the issues and corresponding key questions developed by the analysis team. This identification of key questions helps focus the analysis on the elements of the ecosystem that are most relevant to the management objectives, human values, or resource conditions within the watershed. During the analysis process some issues and key questions have been refined and some newly developed.

I. Watershed and Aquatics

Upland/Soils

Issues:
A. Altered soil condition from accelerated erosion, compaction, road surfacing, change in the flood and fire regimes and soil mixing have caused loss of productivity, increased stream embeddedness, accelerated reservoir siltation, and reduction in water quality and soil water holding capacity.

B. Alteration of sediment supply and conveyance has increased the amount of fine sediment decreasing the quality of aquatic habitat.

Key Questions:
1. What past and current management activities and uses (road and off-road travel, grazing, timber harvest, fire exclusion) have altered soil conditions (productivity, erosion rates, bulk density, type, quantity)?

2. Are there sensitive/at risk soils in the watershed?

3. Have land management activities changed the amount, size and movement of sediment in the watershed?

Hydrology

Issues:
A. Alterations in the watershed have affected flow regimes and water movement, which has affected the stream channel, aquatic and riparian habitats, site productivity, and species viability.

B. Diversions and dams of all sizes have altered the amount and timing of flows in streams, the amount and size of sediment and channel shape and capacity.

Key Questions:
1. What land management activities may be affecting runoff and sediment yield from uplands in the analysis area?

Stream Channels

Issues:
A. Stream channel condition has been degraded, resulting in altered flooding regimes, channel instability, and loss of aquatic habitat.

Key Questions:
!. Have land management activities changed the amount, type and duration of fluvial erosion in the watershed?

2. Have management activities altered channel shape and function?

Riparian Vegetation

Issues:
A. Past and current management activities have altered vegetation directly, and have altered natural processes that change vegetation over time, decreasing sustainability and health of the vegetation.

Key Questions:
1. Have conditions and trends of the various rangeland vegetation communities (upland and wetland/ riparian) passed a threshold so that they are not functional and/or adequately supporting watershed health?

2. Have management activities altered riparian and wetland function?

Water Quality

Issues:
A. Water quality has been altered and does not support the beneficial uses of the streams.

Key Questions:
1. Which water quality parameters does land management have the ability to affect?

2. Have land management altered those parameters such that they no longer support aquatic and riparian species?

Habitat for Aquatic Species

Issues:
A. Alterations in the watershed have affected flow regimes and water movement, which has affected the stream channel, aquatic and riparian habitats, site productivity, and species viability.

B. Wildlife, aquatic, and ecosystem function may have been altered from that which occurred historically due to past and on-going management activities.

Key Questions:
1. How are riparian condition and trends affecting stream and aquatic habitat function?

2. What is the relative abundance and distribution of species of concern that are important in the watershed?

3. What are the current habitat conditions and trends for these species of concern?

4. What are the current habitat conditions and what affect has this had on species composition and distribution within the watershed?

5. What past and on-going human activities are having an affect on wildlife populations and distributions, either positive or negative?

6. Do any invasive and/or non-native plant or animal species occur within the watershed? Have these species altered the historic condition and functions of wildlife habitats?

7. Do any rare or unique habitat features and/or species occur within the watershed that may require special management and/or legal obligations?

8. What types of restoration activities are needed to restore/ maintain habitat conditions?

9. What state, tribal and public needs occur within the watershed and affect wildlife management trends?

10. What were the historical relative abundance and distribution of species of concern and the historical condition and distribution of habitats in the watershed?

II. Vegetation

Forested Uplands

Issues:
A. Fire as a key disturbance process in the watershed has been excluded by management actions and has resulted in altered forest, range, and riparian vegetation.

B. Past management activities have altered forest vegetation directly, and have altered natural processes that change vegetation over time, and decreased sustainability and health of the vegetation.

Key Questions:
1. How has the change in the fire regime in these ecosystems altered forest, range, and riparian vegetation?

2. What changes have occurred to the forest vegetation and what caused them?

Non-Forested Uplands

Issues:
A. Past and current management activities have altered vegetation directly, and have altered natural processes that change vegetation over time, decreasing sustainability and health of the vegetation.

Key Questions:
1. How have landscape patterns of plant communities and seral stages changed over time?

2. What caused the changes in landscape patterns of plant communities and seral stages? What effect have the changes had on the watershed's ability to withstand catastrophic events?

3. Is current livestock management (numbers, intensity, season-of-use, range improvements, etc.) appropriate and consistent with long-term resource sustainability? If not, what management changes are needed to meet - or make significant progress towards meeting - sustainability goals?

Noxious Weeds

Issues:
A. Past and current management activities have altered vegetation directly, and have altered natural processes that change vegetation over time, decreasing sustainability and health of the vegetation.

Key Questions:
1. Are current management activities contributing to an increase in range and abundance of noxious weeds?

2. Are current noxious weed management efforts effective in limiting the spread and/or reducing the abundance of noxious weed species?

Threatened, Endangered, or Sensitive Plant Species

Issues:
A. Past and current management activities have altered vegetation directly, and have altered natural processes that change vegetation over time, decreasing sustainability and health of the vegetation.

Key Questions:
1. What rare or designated sensitive plants occur in the watershed?

2. Has land management changed the amount and distribution of sensitive plant species?

III. Terrestrial Species and Habitat

Issues:
A. Wildlife habitat and species composition has been altered due to past and current management.

Key Questions:
1. What differences exist between historic and current habitat conditions and what affect has this had on wildlife species composition and their habitats?

2. What are the key wildlife species, their habitat requirements and habitat distribution in the watershed?

3. What past and on-going management activities are having an affect on wildlife populations and distributions, either positive or negative?

4. Do any invasive and/or non-native plant or animal species occur within the watershed? Have these species altered the historic condition and functions of wildlife habitats?

5. What state, tribal and public needs occur within the watershed and affect wildlife management trends?

6. Do any rare or unique habitat features and/or species occur within the watershed that may require special management and/or legal obligations?

7. What restoration activities are needed to restore/maintain habitat conditions?

IV. Human Uses

Issues:
A. Cultural and heritage resources are at risk of damage and/or loss.

B. Prior to Euroamerican settlement, lands within the watershed were generally occupied or used by the Modoc, now part of the Klamath Tribes. After the Modoc War (1873), Native American use of the watershed decreased drastically.

C. Federal employees often lack the historical perspective, understanding, or appreciation of the watershed that many private landowners obtain through years of living, working, and recreating in the area.

D. Past and current management activities have altered vegetation directly, and have altered natural processes that change vegetation over time, decreasing sustainability and health of the vegetation.

E. In addition to major historic uses such as grazing, water storage, and logging, public lands within the watershed will be increasingly valued for recreation, open space, and other uses.

Key Questions:
1. What is the general nature and extent of cultural resources located within the watershed?

2. What types of archeological sites are at greater risk and suffering significant and negative impacts from looting, vandalism, recreation, grazing, or other uses?

3. What kinds of relationships/ties remain between the land and the Klamath Tribes?

4. Are Traditional Cultural Properties (TCP), root gathering or areas of critical tribal concern located within the watershed boundaries?

5. What mechanisms exist to increase tribal participation in watershed stewardship?

6. What have been major land uses and changes since historic settlement?

7. What roles have private landowners, the Forest Service, BLM, and other agencies played in the history of the Gerber/Willow Valley landscape?

8. Is current livestock management (numbers, intensity, season-of-use, range improvements, etc.) appropriate and consistent with long-term resource sustainability? If not, what management changes are needed to meet - or make significant progress towards meeting - sustainability goals?

9. Will increased recreation and other uses alter the relatively rustic character of the landscape?

STEP 3. DESCRIPTION OF CURRENT CONDITIONS

The purpose of this step is to present detailed information that deals with the current range, distribution and condition of the relevant ecosystem elements within the watershed. These elements were initially discussed in a less detailed manner in Step 1 "Characterization". Current condition generally reflects information that has been gathered within the past five years.

I. Watershed and Aquatics

Uplands/Soils

Erosion Estimates
Upland erosion was estimated with WEPP (2001) technology for the forest and rangeland vegetation in Table 3-1. For erosion estimates, ecoregion map units 9j and 9g were divided by slope and vegetation into 4 erosion areas: 1) Low gradient rangeland; 2) Rims and moderate gradient rangeland; 3) Low to moderate gradient forest; and 4) Moderate gradient forest. The soils commonly have cobble and gravel clay loam surface layers. Two climate stations, Lava Bed National Monument, California and Sprague River, Oregon, which bracket the Gerber's catchments, were employed. A fifty-year simulation period generated 3640 storms events. Most of the precipitation fell as snowfall from mild Pacific storms, yet most of the erosion was from rainfall events. The WEPP (2001) simulated values are consistent with erosion estimates bases on ecological conditions of rangelands in late seral and forest in mid seral condition in the Gerber area (Soil Survey Staff, 2002).

Table 3-1. Erosion estimates for the Gerber drainage (Water Erosion Prediction Project technology)

			Tons per acre
Landscape	Current	Ground Fire	Crown Fire
Low Gradient Rangeland	0.00	0.01	0.69*
Rims/Moderate Gradient Rangeland	0.00	0.02	1.23*
Low to Moderate Gradient Forest	1.23 to 0.02 with fire	0.02(Open stands)	1.23**
Moderate Gradient Forest	1.91 to 0.04 with fire	0.04(Open stands)	1.91

(Based on Green and Amp infiltration for four select rangeland and forestland habitats topography and surface soil with 50-year climate simulations.)
*Closed Juniper canopy
**Over-stocked stands

Erosion in Low Gradient Rangeland is apt to be minor with a WEPP estimate of 0.00 tons per acre of sediment transport from the soil profile. Only 3 rainfall runoff and erosion events occurred. With simulated ground fire, erosion increased slightly to 0.01 tons per acre with 11 rainfall and 4 snowmelt runoff events. Yet if the Low Gradient Rangeland develops into Juniper woodland and burns as crown fires, the erosion yield jumps to 0.69 tons per acre with 95 rainfall and 70 snowmelt runoff events. So under current conditions the erosion risk is low, but conversion to woodland yields a moderate erosion risk.

Erosion in the Rims and Moderate Gradient Rangeland, for example Goodlow Rim, is apt to be minor with a WEPP estimate of 0.00 tons per acre sediment transport from the soil profile. With ground fire erosion yields 0.02 tons per acre sediment transported from the soil with 11 rainfall and 4 snowmelt runoff events from 3640 storms. If the rangeland develops into Juniper woodland then burns as crown fires, the erosion yield jumps to 1.23 tons per acre with 96 rainfalls and 70 snowmelt runoff events. Under current conditions the erosion risk is low, yet conversion to woodland in the Rims and Moderate Gradient Rangeland yields a moderate erosion risk.

A moderate erosion risk exists in the Low to Moderate Gradient Forest with the current overstocked forest condition. For example Goodlow and Horsefly Mountain in current overstocked condition have a WEPP estimate of 1.23 tons per acre. With well-developed forest openings, erosion drops to a WEPP estimate of 0.02 tons per acre, consistent with the historic Ponderosa pine frequent light surface fire regime (Agee, 1993). A moderate to high erosion risk exist in Moderate Gradient Forest, for example Yainax Mountain, is apt to yield a high WEPP estimate of 1.91 tons per acre sediment transport. Crown fires that drive this erosion risk are likely with frequent fire starts in the area (Fremont Forest Fire Staff, 2002) and overstocked forest. Erosion risk is reduced where forest openings support a well-developed grassy understory.

Compaction Estimates

Compaction effects associated with mechanized cultivation was identified as an issue by the 1930's in croplands. And conservation practices for compaction recovery that began to be identified in the 1940's have been tested and have gained broad acceptance in croplands (Lamarca, 1996). Compaction is a recent issue in forest environs, although many recovery processes learned in croplands can be applied in wildlands.

Initial forest cultivation studies focused on loamy texture soils where mechanized cultivation was common. In a comparative study Gomez et al (2002) examined Ponderosa pine seedling and sapling growth in three California soils of contrasting textures: clayey, loamy, and sandy loam. This study expands the geographic scope with three soil textures and the study period to 3 to 8 years of forest growth from a typical 2-year research timeline. With forest cultivation soil bulk density increased the greatest in the loamy soil at 30 percent and the least in the sandy loam texture soil at 23 percent. By tracking growth and plant-available water in the sites Gomez et al., (2002) identified compaction of the sandy loam soil extended the season of plant-available water. Overall compaction effects on pine seedlings and sapling growth were detrimental in the clayey soil, insignificant or no effect in the loamy soil, and beneficial in the sandy loam soil.

Similarly in croplands, changes in bulk soil density corresponding to measurable reduction in crop growth were associated with the occurrence platy soil structure (Taylor, and Ashcroft, 1972, Veihmeyer, and Hendrickson, 1948). The distribution and depth of soil plates in traffic areas are consistent with the Proctor theory of compaction (Bowles 1979). In uniform soil materials such as roadbeds bulk soil density is a pragmatic measure of soil mechanical conditions. But most native soils have native variability in minerals, grain sizes, and humus. So bulk soil densities tend to be spatially variable, and field scale density effects on soil-plant-water relations are often presented with high levels of uncertainty (Survey Division Staff, 1993, Taylor, and Ashcroft, 1972).

Soil spatial variability, soil variable in mineral matter or humus, is a basis for habitat richness and diversity. Native soil spatial variability presents sampling challenges, which can be addressed with stratified systematic sampling, rather than simple random sampling. (For example, transects stratified by a soil map unit and systematic samples 20 meters apart along a 400 meter transects in a cardinal direction.) At a sample point field scale, information may be evidence of equipment and/or evidence of growth limiting soil environs with compaction. Tallies of samples along transects with growth limiting platy structure (soil plates 5 to 10 cm thick, or soil plates thicker than 10 cm) can be used to estimate detrimental soil conditions.

Fifteen percent increase in bulk density over twenty percent of the project area is the current definition of detrimental soil conditions for both the BLM and USFS – Pacific Northwest Region (RMP/EIS, 1995 and USFS, 1998). The current soil condition standards do not address potential recovery from compaction. Herbaceous stubble and its decay is a key soil-plant recovery process (Lamarca, 1996). Shrink-swell clay soils, which are common in Gerber, have a self-plowing recovery with wetting that improves the recovery rate from traffic or compaction. Shrink-swell recovery was not a part of Gomez's et al (2002) findings, so the sites at Gerber are apt to recover more quickly from the effects of compaction.

Northwest of Gerber Reservoir there is an example of current compaction conditions in forested soils. The example is Mortar Coyote catchment area in the vicinity of Keno Springs and Goodlow Mountain which is dominated by Land Type 34A associated with the Winterim soil series (Kienzle, 1999, Wenzel, 1979). Rogger and Woodchopper soil series are also common. Moderately deep Rogger soil series occurs in Land Types 37A and 38. The deep Woodchopper soil series occurs in Land Type 37A and 35. The example catchment has shrink-swell clays with high shrink swell potential in the sub-soil layers from 18 to 40 inches.

In the Mortar Coyote catchment area, a soil compaction study was conducted. Transects were run and 542 plots were sampled, these samples follow a near normal distribution. The data was grouped into six condition classes that range between low, garden like soil conditions and high platy, compacted soil conditions. Based on this grouping, there are 14% unacceptable compaction condition measures as platy soil in the example catchment area. On a landscape basis with a data distribution estimate and a conservative high/low estimate, the findings show current compaction conditions due to forest management activities is 14%, which is within the 20% guideline for soil resource conditions.

The issue of soil health in Gerber is continuing to be investigated by quantifying disturbance levels. Concerns have been raised on the resource area about excessive soil compaction possibly occurring with repeated use of a mechanical harvester in a forest stand or juniper woodland over time. Use of a mechanical harvester/slashbuster results in greater areal (area of disturbance) ground disturbance since it is not confined to skid roads, although a mechanical harvester reportedly causes less soil compaction since it exerts less pounds per square inch of force/pressure than other ground-based harvesting machinery. Since use of a mechanical harvester is becoming more common and is the most economical choice for density-management treatment of forest stands and juniper woodlands, the resource area is measuring the areal extent of soil disturbance and changes in soil bulk density in representative ground disturbing projects to evaluate soil health.

A representative area for soil compaction and areal disturbance monitoring was selected in the Willow Valley watershed in 2001 to collect baseline, pre-treatment soil data. The project selected is the Kilgore juniper/ fuels reduction treatment in the southern portion of the Gerber Block. Upon project completion, post-treatment soil bulk density samples will be collected, processed, and compared to the pre-treatment samples to determine if soil resources are being detrimentally impacted as per RMP and regional standards and guidelines for detrimental soil impacts.

Infiltration

Infiltration and infiltration recovery are complementary issues to compaction. Generally in sieved soil material infiltration varies with texture: sandy soils have higher rates than clays. However, soil structure and rooting networks have over-riding effects on infiltration (Lamarca, 1996, Soil Survey Division Staff. 1993, Taylor, and Ashcroft, 1972, Veihmeyer, and Hendrickson, 1948). Water recharge varies with understory forest conditions. Ecological site survey data (Soil Survey Staff, 2002) was used to locate sites on a condition gradient for a comparison of infiltration rate and condition of ground cover. A positive correlation between condition (grass cover) and infiltration rates in Pine Fescue sites was found. Infiltration varied from 7.7 ml/s in early mid to 8.2 ml/s in late conditions.

Hydrology

The processes of generating runoff and generating sediment yield are intimately related. The factors that determine runoff rates are similar to the factors that determine sediment yields, and the dominant hillslope erosion processes of sheet wash and rill/gully formation are mediated by water. For this discussion, runoff and sediment yield are discussed simultaneously, and, except where noted, those management actions that increase runoff are also considered to increase sediment yield.

Semi-arid climates, such as found in the analysis area, foster high rates of runoff and erosion. (Langbein and Schumm, 1958, in Leopold et al., 1964). This is a consequence of precipitation rates that are not high enough to allow establishment of extensive ground cover but are sufficient to generate runoff. Hydrologic routing in semi-arid areas is commonly dominated by overland flow, that is, surface runoff generated as a result of low surface infiltration capacity rather than as a result of soil saturation (Knighton, 1984).

In unaltered systems, in general, sediment yields are low from ponderosa pine forests and meadows, are moderate from sagebrush, and are high from juniper stands (Buckhouse and Gaither, 1982). In each of these types, runoff and sediment yield increase with decreasing condition class. The areas with the highest runoff potential are those that foster plant communities with a low proportion of perennial grasses, are currently in “poor” or “fair” ecological condition, and are associated with soils that have moderate to high runoff potentials. Within the analysis area, the ecological condition of many vegetation communities has been degraded by past land management actions and fire suppression. The resulting impacts to hydrologic processes will be discussed below.

Range Management

It is likely that livestock grazing has affected runoff and infiltration rates in the watersheds. Domestic livestock grazing has been shown to increase runoff and sediment yield. In one paired watershed study in Colorado, grazed areas had 30% more runoff and 45% more sediment yield than ungrazed areas. The central finding of this study was that runoff is directly related to the percentage of watershed area exposed as bare soil (Lusby, 1970). Due to differences in physiography and climate, the magnitude of anthropogenic runoff and sediment yield increases in the analysis area may be less than that in the Colorado study.

The extent of bare ground in BLM-administered portions of the analysis area has been quantified from ESI data (Table 3-2). It is evident that bare ground is extensive within the major ecological types, regardless of ecological condition.

Table 3-2. Percent bare ground observed during Ecological Site Inventory on BLM-administered land, by ecological type and condition class.

Ecological Type	Percent of ESI area	Condition Class							
		PNC		Late		Mid		Early	
		Average percent bare ground (range)	Number of samples	Average percent bare ground (range)	Number of samples	Average percent bare ground (range)	Number of samples	Average percent bare ground (range)	Number of samples
Shrubby Loam 16-20”	1%			68 (55–75)	6				
Pine-Mahogany-Fescue 16-20”	6%	15	1	54 (33-68)	13	69	1		
Stony Claypan 14-20”	10%	53 (37-68)	9	52 (25-70)	8				
Juniper Claypan 16-20”	24%	53 (30-66)	14	53 (31-73)	8	68 (66-69)	2		
Juniper Claypan 12-16”	15%	47 (35-66)	3	42 (19-62)	5	57 (44-73)	5	53 (42-63)	2
Shallow Stony 10-20”	18%	63 (56-73)	3	51 (10-79)	22	48 (40-55)	2		
Pine-Sedge-Fescue 16-24”	15%			45 (15-62)	10	40 (15-67)	9		

Although similar information is not available for the National Forest system lands within the watershed, it is likely that they have not been affected to the same degree as BLM-administered lands. In general, higher elevations and greater precipitation may have allowed Fremont rangelands to withstand greater utilization stresses with less degradation of plant communities. For the most part, national forest rangelands benefited from earlier reductions in the number of permitted AUMs, resulting in more time for recovery.

Juniper Encroachment

As noted in the *Vegetation, Non-Forested Upland* section, the density and extent of western juniper has increased dramatically in the analysis area, partly as a result of fire suppression and grazing. What were once savanna-like stands of juniper mixed with sagebrush and/or perennial grasses now have much higher canopy closure and much lower understory cover. Additionally, juniper encroachment is occurring at lower elevations (generally less than 4800 feet) and at the dry edges of meadows. The increase in juniper has likely led to reduced infiltration rates and increased overland flow, as well as reduced water yield (these effects are discussed in more detail in the *Watershed and Aquatics* section of Step 5).

Forest Management

As discussed in the *Vegetation, Forested Upland* section, timber management occurs to varying degrees throughout the analysis area. Depending on their current condition, commercial forest stands may be contributing more or less water yield than would be expected under historic conditions. In those stands that are densely stocked, transpiration has increased, to the detriment of water yield. In those stands that have recently been harvested, transpiration has been reduced and the amount of water available to understory plants and streamflow has been increased. As discussed in the Soils section, increased herbaceous cover in forested areas is correlated with increased infiltration rates. Soil compaction during timber harvest can reduce infiltration locally. Compacted areas near hydrologic flow paths (roads, streams, etc.) may cause increased runoff.

Removing trees and creating openings affects snow dynamics in various ways, depending on the size of openings. Small openings (about two to four acres in size, or about one to three tree heights across) can increase snow accumulation (by reducing canopy interception and influencing local wind patterns) and reduce rates of snow melt (by affecting radiation gains and losses) (Troendle 1982; Baker 1988). Larger openings do not induce increased snow accumulation and can result in more rapid snowmelt due to increased solar radiation and increased rain-on-snow potential (Kattelmann et al. 1983). Thinning has the same general effect as small openings, though the magnitude of potential increases in water yield are directly related to the amount of basal area removed (Troendle and King 1987). Past patch cuts and smaller regeneration units have probably increased snow accumulation, which would lead to delayed snow melt and increased streamflow during the later spring and early summer.

Roads

In general, the road network in the analysis area has increased runoff, increased peak flows, and decreased infiltration and soil water storage. These effects are roughly commensurate with road density (the length of roads per unit area).

Although annual precipitation rates are fairly low, high intensity precipitation or snow melt events (especially those that occur in areas with impermeable soils) can cause runoff generation. Roads that channelize flow intercept this runoff and deliver it to streams at a faster rate than would occur naturally. Roads that are lower than the surrounding land surface can also cause gullies to form, since the road acts as a “base level” to which flow paths incise.

Subwatershed road densities in the analysis area range between one and four miles per square mile (See Table 3-3). In general, road densities (including all roads – open and closed) are lowest in the Upper Lost River watershed (Willow Valley) and the lower elevation portions of the Gerber watershed. This is primarily a result of different land management activities (range management requires fewer roads than timber management) and the presence of large lakes and wetlands at low elevations. Despite these low road densities, there are numerous roads that parallel streams in the Willow Valley and Antelope subwatersheds. The relative magnitude of drainage network extension is particularly high in the Antelope and Willow Valley subwatersheds, partly as result of low natural drainage density.

Table 3-3. Subwatershed road densities in the Gerber area.

Subwatershed	Area	Road Length	Road Density	Road Surface Area[1]	Flow Capture on Roads	Increase in Drainage Network Length[5]	Road-Stream Crossings	Road Impact Index
Name	(sq mi)	(miles)	(miles/sq mi)	(acres)	(mi)	(%)	(#)	
Ben Hall[2]	17.4	61.3	3.5	104.0	3.7	18	31	0.29
Horse Canyon	27.8	97.0	3.5	164.6	3.8	13	57	0.53
Buckmaster Creek	8.6	32.6	3.8	55.3	0.3	2	18	0.18
Dry Prairie[2]	33.3	69.6	2.1	118.1	13.4	49	31	0.17
West Gerber Frontal	30.4	55.0	1.8	93.3	3.3	11	27	0.13
Long Branch	23.4	50.8	2.2	86.2	3.1	10	44	0.25
East Gerber Frontal	23.7	45.2	1.9	76.7	9.3	34	26	0.13
Barnes Valley	44.8	102.6	2.3	174.1	7.1	10	91	0.55
Miller[2]	41.4	52.4	1.3	88.9	8.7	15	54	0.18
Pitch Log	24.2	52.4	2.2	88.9	1.3	4	40	0.23
Antelope	42.5	86.2	2.0	146.3	29.9	69	69	0.37
Willow Valley Reservoir	26.9	24.3	0.9	41.2	9.6	48	20	0.05
Rock[3]	49.6	117.7	2.4	199.7	10.2[4]	18	75	0.47
Upper Lost River Frontal[3]	26.1	29.9	1.1	50.7	5.0[4]	14	14	0.04

[1]Assuming a 14 foot road width for all roads in the analysis area.
[2] Some private lands within these subwatersheds were not included in the 2002 road inventory.
[3]The California portions of these subwatersheds were not included within the 2002 road inventory, and data has been supplemented with GTRN data when applicable.
[4]Flow capture data available only for roads within Oregon.
[5]Calculated by comparing flow capture on roads to stream mileage.

The subwatersheds with the highest road densities are in the northern portion of the analysis area. The Ben Hall, Horse Canyon, and Buckmaster subwatersheds all have road densities in excess of 3.5 miles per square mile. Relatively high road densities in these and other subwatersheds are at least partly a consequence of more intense forest management activities, which itself is a result of greater precipitation and deeper soils.

These soils have relatively high infiltration rates (as discussed in the *Uplands/Soils* section), and road impacts are not strongly expressed at the local scale (i.e., gullies do not commonly occur at culvert outfalls). For this analysis, the degree to which roads supply runoff and sediment to streams is estimated using two methods:

-Drainage network extension due to connections between road surfaces and perennial or intermittent channels is estimated using results of the 2002 BLM/USFS road inventory; and

-Road Impact Index (RII), a qualitative measure of sediment delivery risk associated with road density and the number of stream crossings, calculated as:

[RII = (acres of road / subwatershed area) x (number of stream crossings)].

As used in this analysis (as a relative measure of potential sediment delivery), the RII method is based on the following assumptions:

-As a result of increased extent of exposed surfaces, potential sediment yield increases with increased road density; and

-There is a high probability that sediment enters stream channels at road- stream crossings (Rosgen, 1991).

Diversions and Impoundments

Major reservoirs, which were built as early as 1910 (the enlargement and regulation of storage capacity at Clear Lake), collect a large portion of total basin yield for the Gerber watershed and the Antelope and Willow Valley subwatersheds (Table 3-4). Numerous smaller reservoirs are scattered throughout the Gerber and Upper Lost River watersheds. Many of these occur in areas that once functioned as wetlands, and thus did not require extensive construction to meet irrigation needs. While these developments can affect watershed function, especially at small scales, their individual impacts are likely very small relative to those caused by the larger developments.

Reservoir filling occurs from late fall through spring. Reservoir water levels vary widely between years and throughout a given year. Water levels are typically highest in late spring and lowest in autumn, and some reservoirs are frequently drained completely.

Reservoirs in the headwaters of Barnes Valley and Long Branch Creeks are capable of storing approximately 18 and 12 percent, respectively, of estimated average annual water yield from these subwatersheds. Reservoirs in the Upper Lost River watershed, especially Willow Valley Reservoir and those in the headwaters of Antelope and Rock Creeks, are likely capable of storing an equal or greater percentage of annual water yield, although the data necessary to estimate this is not currently available.

Table 3-4. Initial dates of completion for select dams in the analysis area.

Year	Development	Year	Development
1910	Clear Lake	1952	Bumpheads
1919	Strawberry	1955	Round Valley
1920	Antelope	1955	Grohs
1920	Willow Valley Reservoir	1957	Dog
1920	Wilson Lake	1958	Dog Hollow
1924	Tull	1958	Upper Midway
1925	Gerber Reservoir	Pre-1960	Dry Prairie
1936	Copeland	1960	Twenty-one
1937	Little Squaw Flat	1961	Midway
1937	Midway	1961	Timber Hill
1945	Arkansas Reservoir	1968	Big Adobe
1946	Kilgore	1983	Wild
1948	Threemile		

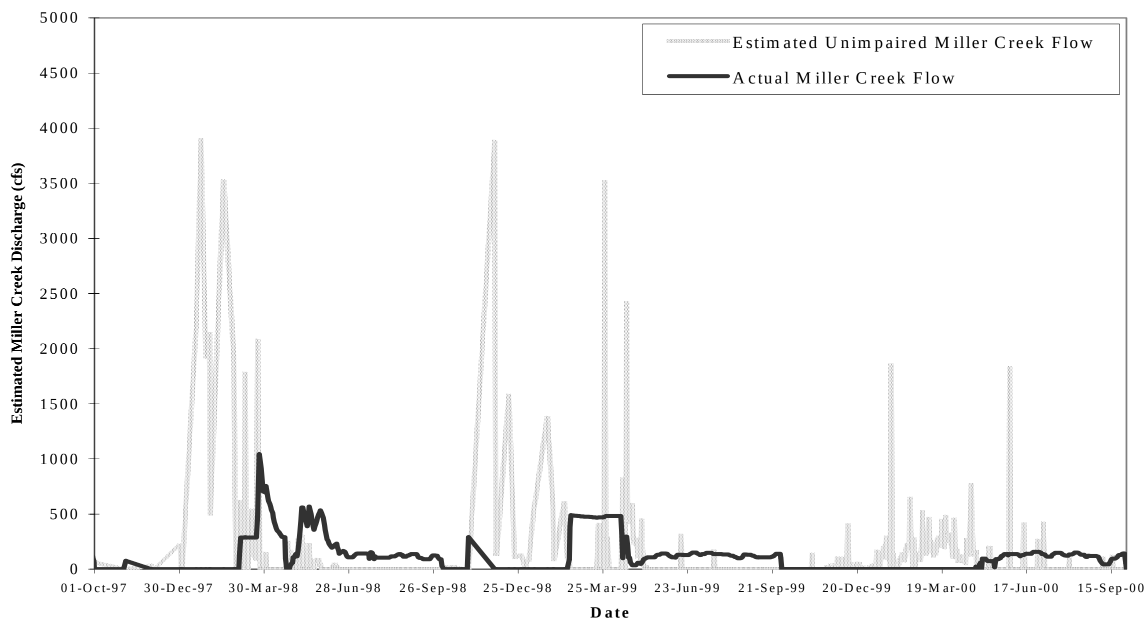
With the exception of Gerber, Willow Valley, and Clear Lake, reservoirs in the analysis area are not designed to capture the entire volume of water that enters them or passes their intakes (even the large reservoirs spill excess inflow occasionally). The three large reservoirs tend to strongly influence downstream flow patterns over time scales ranging from daily to annually. Figure 3-1 illustrates actual Miller Creek flows (a combination of irrigation releases and spill) for water years 1998 and 2000 compared to approximate flows that would have occurred without the presence of Gerber Dam (an estimate based on daily changes in reservoir storage that does not account for evapotranspiration losses) based on data from USBR Klamath Basin Area Office. Generally, these dams increase summer baseflows, reduce or eliminate winter peak flows, and change the timing of peak flows. During the period December through March (the time when peak flows would naturally occur in Miller Creek), USBR data indicates that water in excess of irrigation flows was released from Gerber Dam in 32 of the 75 years from 1926 to 2000. In the other 43 years, no flow in excess of winter minimum baseflows (approximately 2 cfs) was released.

While the magnitude of flow alterations varies, it is apparent from USBR data and observations that Clear Lake and Willow Valley Reservoir have similar effects on flows in the Upper Lost River and the East Branch of the Lost River.

Other on-stream impoundments and off-stream diversions tend to dampen, rather than eliminate, flood peaks. This effect is commensurate with the volume of the spring flood, water rights, and the conveyance capacity of intake mechanisms. Some reservoirs may be capable of capturing smaller flood peaks, such as those caused by high intensity precipitation events or melt of short-lived snowpacks.

Impounded water is usually used for irrigation of pastures or hayfields. Irrigation releases usually occur from April to October. As a consequence of high rates of evapotranspiration from irrigated fields, return flows are likely much less than irrigation supply flows. Nonetheless, they do contribute an indeterminate volume of summer baseflow to streams, as does reservoir seepage and releases directly into stream channels. This is partly at the expense of receding flows that occur in spring as snow melt and subsurface flow reaches streams. Baseflow may increase in some downstream reaches at the same time baseflow is reduced in upstream reaches. It is unclear whether the magnitude of baseflow augmentation that occurs is greater or less than the decreases to baseflow caused by decreased floodplain aquifer recharge downstream from impoundments.

Figure3-1. Actual Miller Creek flows for water years 1998 and 2000 compared to estimated approximate flows occurring without the presence of Gerber Dam.

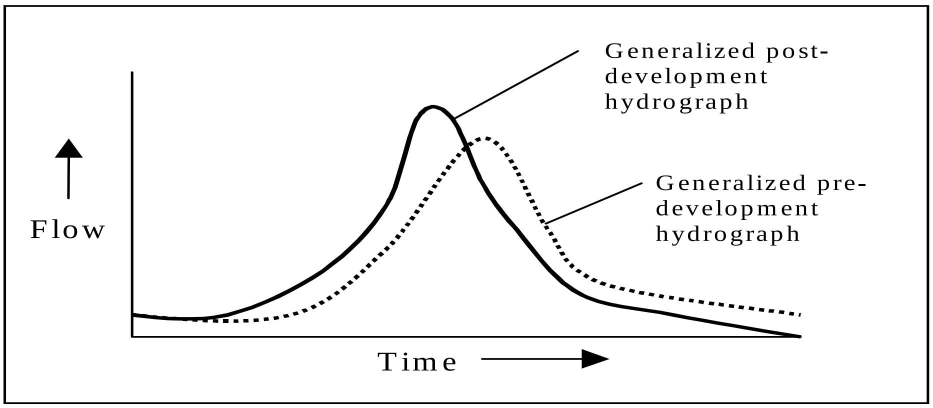


Changes in Channel Form

As discussed in the Stream Channels section, many streams in the analysis area have incised and/or widened during the historic period. The hydrological linkage between floodplains and meadows (via floodplain inundation or subsurface flow paths) has been diminished or severed. Soils in these areas are deeper, loamier, and more absorbent than those on hillslopes - and thus have greater water storage capacity than most soils in the watershed. Recharge of these shallow aquifers does not frequently occur at present, and the supply of late-season baseflow to streams has been reduced as a result.

In terms of watershed management and its effect on runoff and erosion, the impacts of road networks, increased stand densities in woodlands and forests, and altered stream channels are of highest concern. These management impacts lead to increased and earlier peak flows and reduced infiltration and baseflows compared to reference, or pre-settlement, conditions (Figure 3-2).

Figure 3-2. Generalized hydrographs illustrating the concept of increased and earlier peak flows and reduced baseflows.



Stream Channels

Natural processes of sediment supply, transport, and deposition are critical to shaping stream channels. Many stream landforms, ranging in size from gravel bars to floodplains, are the result of interactions between sediment and flowing water. Many of these processes have been altered by land management activities.

Stream channels integrate the condition of upstream drainage areas, adjacent riparian areas and hillslopes, and, in some cases, downstream areas. Changes in stream channel form reflect a combination of natural channel evolution processes (such as meander migration, floodplain formation, and pool-riffle dynamics) and anthropogenic influences (such as riparian vegetation conversion, diminished coarse woody debris inputs, irrigation withdrawals). As with watershed processes, fluvial processes act on many spatial and temporal scales, although most channel change takes place during high flow events that occur no more than a few times a year.

Channel Shape
A variety of different types of stream channels occur in the analysis area. The Rosgen (1996) classification system is widely used to categorize stream channels (see Table 3-5 and Figure 3-3), and will be used in this document as a framework for conceptualizing stream channels and fluvial processes.

Table 3-6 shows the distribution of Rosgen channel types within some streams in the Gerber watershed. Some streams in the Upper Lost River watershed have also been classified to Level I channel types, but data are not in a format that allows tabulation. It is assumed that the general distribution of stream types in the analysis areas is similar to that observed in the seven streams listed in Table 3-6.

Rosgen B stream types occur in steep-walled valleys, such as along Miller Creek or in Barnes Valley Creek between the Mainhaul Road and the CCC Road. Rosgen C, E, F, and G stream types generally occur in more open settings. Adjacent terraces (relict floodplains) may constrain F and G channels, although the alluvial material that comprises terraces can be eroded as these channels develop.

Table 3-5. General description of Rosgen Level I stream types (paraphrased from Rosgen, 1996).

Type	Description
A	A stream types are associated with landforms of high relief, are deeply incised and characterized by steep gradients. They typically have cascading, step/pool morphology with high energy, sediment supply and transport potential.
B	B stream types are associated with narrow valleys. They are moderate gradient, low sinuosity streams that are stable both vertically and laterally, and are dominated by riffles and occasional scour pools.
C	C streams types are associated with broad alluvial valleys with well-defined floodplains. They are low gradient, meandering streams characterized by riffle/pool sequences and point bars.
E	E stream types are found in broad alluvial valleys and meadows with well-developed floodplains. They are low-gradient, highly sinuous streams that are stable due to well-vegetated banks. When vegetation is lacking these channel types are highly sensitive to disturbance, which may result in increased levels of streambank erosion and downcutting. The E stream type provides excellent fish habitat through undercut banks, clean spawning gravels, and numerous deep pools.
F	F stream types are entrenched within terraces (relict floodplains). They have gentle gradients and high width-depth ratios, and develop meandering pool/riffle sequences over time (a transition that requires high bank erosion rates in order to occur).
G	G stream types are "gully" streams that have incised into narrow valleys or terraces. They have moderate slope and sinuosity, and high rates of bank erosion and vertical adjustment.

Figure 3-3. General Diagram of Rosgen Level I Stream Types.

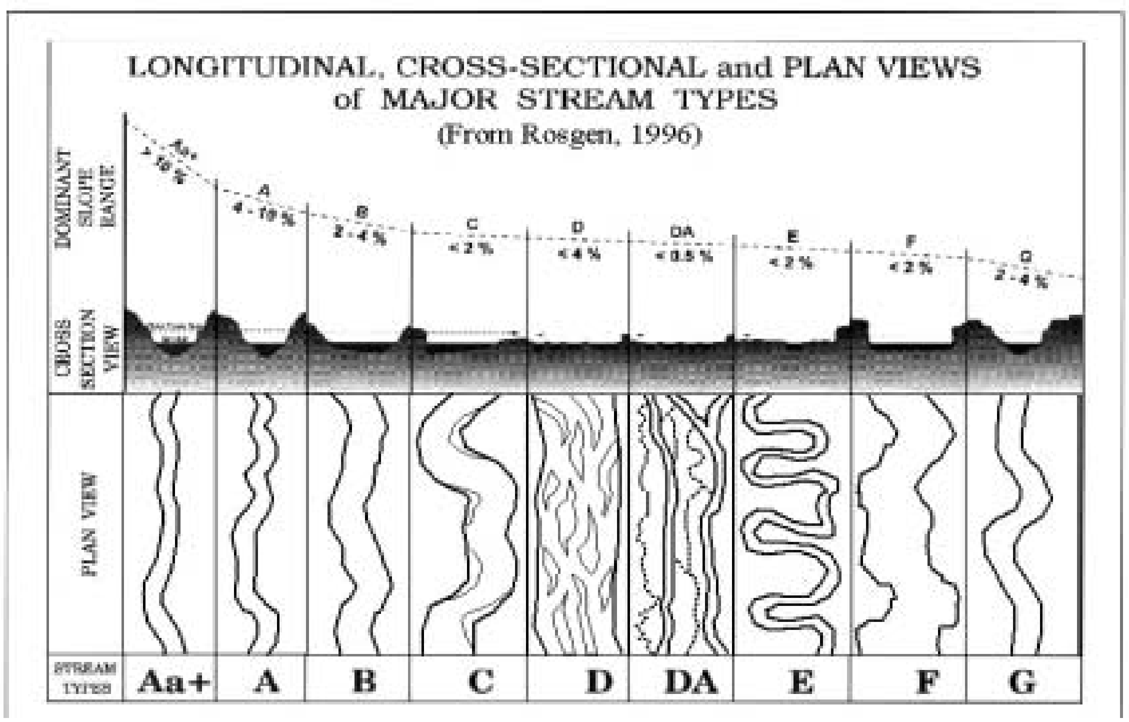


Table 3-6. Rosgen (1996) Level I channel classification for select streams in the analysis area.

Stream Name	Total Length Classified* (miles)	Rosgen Level I Stream Type (miles) B	C	E	F	G
Barnes Valley Creek	11.5	1.7	6.0	-	3.8	-
Ben Hall Creek	1.8	-	-	-	1.8	-
Casebeer Creek	1.6	0.1	-	1.2	0.3	-
Lapham Creek	0.6	-	-	-	0.6	-
Long Branch Creek	4.9	0.5	-	1.0	3.3	0.2
Miller Creek	9.8	7.7	-	2.2	-	-
Pitch Log Creek	5.3	1.1	-	0.3	3.7	0.1
Total	35.5	11.0	6.0	4.6	13.6	0.3
Percent of Streams		31%	17%	13%	38%	1%

*Based on analysis of maps and air photos.

Roughly one-third of the streams in the analysis area are Rosgen B stream types. More than one-third of channels are Rosgen F stream types. These F channels are either deep and relatively narrow or wide and shallow. The F streams are incised into historic floodplains (which are now terraces).

The remaining two-thirds of the streams are divided fairly evenly into C and E stream types. These types are found in unconfined settings, typically in association with floodplains or wet meadows. C streams are steeper and less sinuous than E types. Functionally, C streams adjust in response to bedload and LWD, while E stream types are shaped primarily by the rooting strength of riparian vegetation. In addition to stable C and E stream types that are connected with their pre-settlement floodplains, these stream types are also becoming re-established within the meander belts that develop in association with F stream types (these stream types are difficult to distinguish during office-based Level I classification).

Rosgen G stream types occur in headwater areas that are actively adjusting to decreased bank stability and/or increased stream energy. G stream types were not common during the air photo analysis, likely because many of streams have already evolved to F stream types. Nonetheless, it is likely that the air photo analysis under-represented these stream types.

Bank stability

Fluvial erosion, or erosion occurring as a result of streamflow, can occur either laterally or vertically. Streams with decreased bank stability are susceptible to fluvial erosion, especially in subwatersheds that currently experience increased peak flows as result of land management activities.

The processes driving these two types of erosion are similar, and streams often erode laterally in response to vertical erosion (Simon, 1989). Vertical erosion (“incision”) results from increases in streamflow or lowering of the base level to which stream gradients are adjusted. Incision proceeds upstream via “headcutting”. Streambanks with no vegetation or with weakly-rooted vegetation are particularly susceptible to lateral erosion. Such conditions may also be indicative of bank trampling and streambank sloughing caused by cattle. Bank erosion and reduced width-depth ratios can also result from sediment loading in excess of a stream’s sediment transport capacity. Mid-channel bars that may develop in such situations force flows towards banks; as the channel widens and becomes more shallow, streambed roughness increases and more fine sediment is deposited (Leopold et al., 1964).

The subwatersheds most vulnerable to excessive fluvial erosion are those that:

-Are currently adjusting to historic channel incision (through meander-belt development and bank erosion) (typically Rosgen F stream types);

-Have extensive lengths of stream channel that do not benefit from riparian-sensitive grazing management schemes (such as rest-rotation or exclusion), and are thus unable to recover from

historic grazing impacts; and,
-Have high riparian road densities and high proportions of juniper encroachment.

Some streams that do have extensive riparian exclosures and/or riparian-sensitive management schemes continue to experience high erosion rates. The hydrologic legacy of historic grazing and timber harvest continues to affect channel processes in these streams, despite the implementation of improved land management programs in the past few decades. Channel response is slower than vegetation response, primarily because the processes responsible for development of landforms on the spatial scale of stream segments operate over much longer time scales than the processes responsible for development of vegetation communities (Platts, 1991; Kondolf, 1993). Information collected during PFC surveys supports this interpretation; of the streams for which excessive erosion or deposition was noted, very few were lacking adequate floodplain or channel roughness elements.

A variety of monitoring information exists for streambanks in the analysis area. Information is not available for all streams, and for some streams information is available only for that portion administered by the BLM. Because of the generally similar physiography and land use throughout the analysis area, some inferences can be made for streams lacking survey data. Inferences for headwaters portions of streams, however, cannot be made on the basis of data collected in the downstream portion of the same stream.

Bottomline Surveys
The entire lengths of Horse Canyon, Barnes Valley and Long Branch Creeks were surveyed in 1994 using the USFS Bottomline protocol (Ochoco National Forest, 1995). These surveys identify the extent of cutbanks along both banks of the survey length (Table 3-7).

In 1994, all of the surveyed streams had a moderate proportion of streambanks that were susceptible to erosion. The reaches surveyed that year are generally unconfined and located in the lower segments of major streams; as such, portions of these reaches have evolved into Rosgen F stream types that are experiencing high rates of bank erosion.

The 2001 surveys focused in smaller tributaries located in upper watershed positions. In general, exposed cutbanks were rare in reaches with large portions of Rosgen B, C, or E stream types, or in small, well-armored drainage ways. Exposed cutbanks were more extensive in channels that had evolved into F stream types (such as has occurred along much of the upper segment of Barnes Valley Creek).

As discussed above (with regards to Channel Shape), meander migration and cut bank development are naturally occurring processes in many stream types. The high rates of bank erosion observed in F and G stream types are a reflection of channel adjustment following historic (and, to a lesser degree, ongoing) land management impacts.

Greenline Vegetation Surveys
Vegetation compositions and dominance along streambanks in the analysis area varies, depending on stream type and land management history (refer to previous discussion of Riparian Vegetation in this section). The proportions of various vegetation types at nine BLM riparian monitoring sites along five streams have been documented using the Greenline survey protocol (described in Winward, 2000). These surveys were first conducted in 1994/1995 and again in 1999/2000 (Table 3-8). Survey transects of streamside vegetation

extend parallel to the stream, along both sides of the stream, and typically cover a total length of 800 to 1000 feet.

Table 3-7. Summary of USFS Bottomline Survey data.

Stream	Year	Length	% Exposed Cutbank
Horse Canyon	1994	2.0	20
Barnes Valley	1994	8.9	20
Long Branch	1994	4.8	14
Barnes Valley Creek	2001	2.6	30
Barnes Valley Creek, Unnamed Tributary	2001	1.2	0
Bachelor Creek	2001	1.3	1
Bachelor Creek Tributary, Spring 1	2001	0.1	0
Bachelor Creek Tributary, Spring 2	2001	0.3	0
Lapham Creek	2001	2.8	<1
Little Squaw Flat Tributary	2001	3.4	10
Strawberry Creek	2001	2.5	4
Squaw Flat Tributary	2001	0.1	0
Pitch Log Creek	2001	5.5	6

Table 3-8. Bank stability ratings from BLM Greenline riparian surveys.

Stream Segment	Initial Survey		Subsequent Survey	
	Date	Rating[1]	Date	Rating[1]
Barnes Valley (BV-3)	July 1994	8	July 1999	8
Barnes Valley (BV-10-2)	Sept 1995	8	July 2000	9
Pitchlog (PL-4)	July 1994	6	Aug 1999	7
Pitchlog (PL-9)	July 1994	7	July 1999	7
Pitchlog (PL-6)	Aug 1995	6	July 2000	6
Long Branch (LB-7)	Aug 1994	8	July 1999	8
Long Branch (LB-5)	July 1995	8	July 2000	8
Ben Hall (BH-1)	July 1994	8	Aug 1999	7
Antelope (Duncan Springs, D-2)	Sept 1995	9	July 2000	9

[1]Based on a 10 point stability rating (Integrated Riparian Evaluation Guide, USFS, 1992): 1-2 = very low, 3-4 = low, 5-6 = moderate, 7-8 = high, 9-10 = excellent

Greenline data indicate that vegetation and substrate (boulders) provided moderate to high bank stability at the time of the initial surveys. Since then, bank stability has improved at two sites, remained constant at five sites, and decreased at one site. The site with the highest bank stability (Antelope Creek) has been within an exclosure since 1977. Sites with lower ratings are primarily F stream types.

Proper Functioning Condition (PFC) Surveys

PFC surveys attempt to qualitatively assess the physical functioning of riparian areas, through consideration of hydrology, vegetation, and soil/landform attributes. The assessment classifies streams as being in one of three conditions:

Proper Functioning Condition - Riparian conditions are adequate to dissipate stream energy associated with high flows, store sediment, improve flood-water retention and groundwater recharge, and develop root masses that stabilize streambanks against cutting erosion.
Functional At Risk - Some riparian conditions necessary to attain PFC are present, but at least one riparian attribute/process causes a high probability of degradation with a relatively high flow event.

Nonfunctional - Riparian conditions are clearly inadequate to ensure the values of properly functioning streams.

For those streams identified as Functional at Risk, the trend of riparian conditions is determined. Recruitment and establishment of riparian species (or the absence thereof) that indicate an increase (or decline) of soil moisture characteristics can be especially useful in this regard, provided that recent climatic conditions are considered in the interpretation. If there is insufficient evidence to make a determination that there is a trend toward or away from PFC (upward and downward, respectively), then the trend is not apparent (USDI, 1998).

BLM interdisciplinary teams surveyed approximately 35 miles of streams in the analysis area between 1994 and 1997 (Table 3-9). These surveys were generally limited to BLM lands, and some subwatersheds were not surveyed at all.

Table 3-9. Summary of PFC ratings for streams on BLM land within the analysis area.

Subwatershed	Total	PFC		FAR-U		FAR-N		NF	
	Miles	miles	%	miles	%	miles	%	miles	%
Ben Hall	2.6	1.1	42%	1.2	46%	0.3	12%		
Long Branch	1.4	1.2	88%			0.1	8%	0.1	4%
East Gerber Frontal	5.6	3.4	61%			0.6	11%	1.6	29%
Barnes Valley	3.2	2.8	88%			0.4	13%		
Miller	2.4	0.9	38%			1.1	46%	0.4	17%
Pitch Log	7.2	1.6	22%			0.4	5%	5.2	73%
Antelope	6.5	3.9	60%			0.6	9%	2.0	31%
Willow Valley Res.	3.7	3.7	100%						
Rock	2.3	0.7	30%					1.6	70%
Total	34.9	19.3	(55%)	1.2	3%	3.5	10%	10.9	31%

High percentages of stream length within the Pitch Log and Rock Creek subwatersheds were determined to be in non-functional condition. In the case of Pitch Log, riparian vegetation was lacking and bank erosion was severe, particularly along the drainage below Willow Springs. Conditions in the Pitch Log subwatershed appear to be recovering, as indicated by willow re-establishment. In Rock Creek, riparian vegetation establishment and channel processes were detrimentally affected by diversions.

In most of the segments classified as “Not Functioning” or “FAR-No Apparent Trend” excessive erosion or deposition was noted. Vertical instability (i.e., susceptibility to incision), on the other hand, was not noted as a problem in most of these segments, perhaps as a consequence of vertical controls imposed by the occurrence of coarse bedrock at shallow depths.

Bank Erosion Pins

Erosion pins were installed in selected cutbanks of three streams in 1996. At each site, three re-bar stakes were pounded flush with the surface of a vertical cutbank. The stakes were placed horizontally in a line up the cutbank, with one pin at the bottom of the cutbank, one in the middle, and one at the top. The length of exposed pin was measured one year later, giving a value for bank erosion over one high flow season (Table 3-10).

This data suggests that during the high flows of winter 1996 there was substantial bank erosion at the study sites. Although the sites were not chosen to be representative of conditions in entire stream segments, neither should they be considered anomalous. The fact that bank erosion occurred along the entire height of cut banks suggests that, between 1996 and 1997, stream channels were actively widening at the study sites. (Additional bank erosion pins were installed in Pitch Log Creek in 2002, and this effort may be expanded in the future.)

Table 3-10. Measured bank erosion at sites on 3 streams.

Stream	Site #	Erosion from bank surface between 11/96 and 10/97			
		Average	Bottom	Middle	Top
Ben Hall	1	11 cm	8 cm	1 cm	23 cm
Long Branch	1	20 cm	11cm	32 cm	17 cm
	2	36 cm	10 cm	44cm	55cm
Pitch Log	1	15 cm	12 cm	6 cm	28 cm
	2	7 cm	5 cm	3 cm	14 cm

Bed Material

Pebble count data is available for 17 reaches of 7 streams in the analysis area (Table 3-11). This data was collected in 1997 and 2000 in order to quantify the relative proportion of different bed material types.

Table 3-11. Pebble count data for streams in the analysis area (1996 and 1997 BLM stream surveys).

Stream	Reach	Silt/Clay/Sand (%)	Gravel (%)	Cobble (%)	Boulder (%)	Bedrock (%)
Barnes Valley	Reach 1 (1)	22	39	5	0	0
	Reach 1 (2)	5	57	5	0	0
	Reach 2	28	22	39	11	0
Miller	Lower	7	26	32	35	0
	Upper	11	29	33	23	4
Antelope	Reach 1	36	32	16	16	0
	Reach 2a	20	35	30	15	0
	Reach 2b	9	40	33	18	0
	Reach 3a	17	28	39	16	0
	Reach 3b	13	25	42	20	0
	Reach 4a	9	19	25	47	0
	Reach 4b	6	29	29	36	0
	Reach 5	15	35	38	12	0

For the most part, substrate texture is finer in low gradient stream reaches and coarser in high gradient reaches. Data from some reaches suggests bed armoring. Examples of this include the upper and lower reaches of Barnes Valley Creek and the lower reach of Miller Creek, both of which have anomalously high proportions of cobble/boulder material (diameter 6.4 cm to 4.1 m).

In-Stream Large Wood Recruitment and Retention

Large woody debris (LWD) enters stream channels in the analysis area primarily via tree fall that results from windthrow, mortality, or bank failure. The most wood (though not necessarily the largest) tends to originate in areas that are experiencing high mortality of trees, either due to insects, disease, or fire. In western Oregon and Washington, most instream LWD originates within 20 meters of the stream channel (McDade et al. 1990), and almost all LWD originates within 1 site potential tree height of the stream (FEMAT 1993). It is assumed that these values apply to the analysis area.

The rate at which LWD is supplied to streams depends on the character of adjacent landforms and vegetation patches. In forested canyon settings, LWD recruitment is expected to be relatively high, while wood delivery to streams that flow through meadows and rangelands occurs at lower rates. LWD surveys conducted in five streams in the analysis area illustrate this point (Table 3-12).

The stream reaches that have the highest LWD volumes tend to be adjacent to hillslopes, typically Rosgen B or C streams. Streams that are incised or flow through open meadows generally have lower LWD volumes, since there are fewer trees near the stream channel. Currently, since pines and junipers have become established on terraces, more LWD is available to F channel types. E channel types are highly associated with wet meadows, and conifer trees typically do not occur in large numbers in these areas. As a result, not much LWD is supplied to E channels.

The instream role of LWD varies according to stream type and the size and location of LWD pieces. In B and C channels, structural elements such as boulders and LWD redistribute velocity patterns and cause scour pools, gravel bars, and side channels to form. The primary function of LWD in these streams is to diversify channel features. In narrow F channels, wood that enters (primarily via bank erosion) tends to direct streamflow against the opposite bank, accelerating bank erosion. This hastens the process by which incised F channels widen out and establish new floodplains. In both wide and narrow F channels, LWD creates depositional areas that can be utilized by colonizing plants. Instream LWD is not common in E channels and does not play a key role in shaping those channel types.

LWD stability is a function of length, diameter, channel location, species, and stream type. Longer pieces, especially those with lengths greater than bankfull width and/or rootwads attached, are more stable and less prone to move great distances when mobilized. Jams of LWD tend to be more stable than individual pieces. All things considered, most instream LWD is currently relatively unstable and therefore less likely to contribute to development of desired habitat features.

The interaction between beaver activity and channel processes has been diminished. By constructing dams and creating low gradient expanses of emergent vegetation, beavers can effectively control the longitudinal gradient of streams. As a result, sediment deposition occurs and valleys accumulate material (or “aggrade”). In the absence of beavers, streams are more prone to incise.

Riparian Vegetation

Ecological Types

The types and condition of wetlands and riparian areas found in Gerber’s catchment are based on soil and vegetation surveys (Riegel et al., 2002, Soil Survey Staff, 2002). Ecological sites were developed in a 1990’s soil survey by the Natural Resource Conservation Service staff with the Bureau of Land Management, Klamath Resource staff (Soil Survey Staff, 2002). Following is a brief discussion of the major riparian habitat types in the analysis area. (For more detailed discussion of ecological sites, refer to the *Vegetation/ Non-forested Upland* section.)

Playas

Four wetland playa ecological sites were large enough to map on a soil survey: Ephemeral Lakebeds, Dry Meadow, Semi-Wet Meadow and Wet Meadow (Soil Survey Staff, 2002). Playas distributed across the Gerber drainage display an ephemeral springtime sea of spike rush, *Eleocharis*, and rush, *Juncus balticus*. These spike rush and rush plants are resilient rhizomatous plants, which fit the wetland ecology of domination in mid to late seral stages (Mitsch and Gosselink, 1993). Clay soils and vernal or seasonally ponded oatgrass wetlands with shrink-swell clays are characteristic of the analysis area (Riegel et al., 2002, Soil Survey Staff, 2002). In the late fall, shrink cracks are visible in the clay-rich mesic graminoid ecological type. Fall shrink cracks are less obvious in the silt-rich Nebraska sedge and Geyer willow ecological types (Riegel et al., 2002).

Table 3-12. Distribution and size of large woody debris for select streams (from ODFW surveys).

Stream	Reach[1]	Length (miles)	Gradient (%)	Channel Form[2]	Large Woody Debris[3]			Riparian Trees[5]		
					Pieces (#/mile)	Volume (m^3/mile)	Key Pieces[4] (#/mile)	Total (#/mile)	>20" DBH (#/mile)	>35" DBH (#/mile)
Long Branch Creek	1	0.1	4.9	Constrained by Terraces	0.0	0.0	0.0	2577	322	0
	2	0.1	2.2	Unconstrained, Single Channel	9.7	1.6	0.0	1125	158	0
	3	0.3	0.2	Constrained by Terraces	0.0	0.0	0.0	2038	106	0
Pitch Log Creek	1	0.2	2.8	Constrained by Hillslopes	180.3	170.7	6.4	5306	158	0
	2	0.4	0.6	Constrained by Terraces	11.3	30.6	1.6	4023	158	0
	3	0.1	Not Surveyed							
	4	0.4	0.4	Constrained by Alternating Hillslopes and Terraces	17.7	51.5	1.6	3057	0	0
	5	0.2	Not Surveyed							
	6	0.4	1.8	Constrained by Hillslopes	16.1	64.4	4.8	4023	0	0
Willow Springs Drainage	1	0.2	Not Surveyed							
	2	0.6	0.4	Unconstrained, Single Channel	4.8	4.8	0.0	803	0	0
	3	0.2	0.1	Constrained by Terraces	41.9	19.3	0.0	7403	0	0
	4	0.5	0.5	Unconstrained, Single Channel	11.3	3.2	0.0	2038	0	0
Barnes Valley Creek	1	0.1	0.5	Constrained by Terraces	0.0	0.0	0.0	7080	0	0
	2	0.7	1.7	Constrained by Hillslopes	6.4	19.3	1.6	5196	137	0
	3	0.8	0.6	Unconstrained, Single Channel	1.6	11.3	0.0	3216	32	0
	4	0.1	0.5	Unconstrained, Single Channel	0.0	0.0	0.0	0	0	0
Miller Creek	1	0.4	1.6	Constrained by Alternating Hillslopes and Terraces	12.9	14.5	1.6	2899	158	0
	2	1.0	2.0	Constrained by Hillslopes	9.7	9.7	0.0	1552	158	0
	3	0.8	0.7	Constrained by Hillslopes	14.5	25.8	1.6	4414	0	0

[1]Reaches are defined by functional characteristics such as tributary junctions or changes in channel form; reach numbering begins at the downstream end of a stream and increases upstream.
[2]Determined by the morphology of the active channel.
[3]Minimum size 15 cm diameter by 3 meters length.
[4]Minimum size is 60 cm diameter by 10 meters length.
[5]Sampled along 30 meter transects perpendicular to the stream.

Streambanks

Riparian ecological types along streams are similar to the Semi-Wet Meadow and Wet Meadow ecological sites, which have high proportions of mesic grass and Nebraska sedge (Riegel et al., 2002). Generally, Gerber's riparian and wetland habitats show the influences of low relief valleys and clay soil bank materials. Clayey banks resist sloughing creating vertical banks, rather than low wide channel banks associated with sandy banks.

Willow and cottonwood ecological types, which are dependent on coarse (sand or gravel) bank material with relief, are uncommon in Gerber (Riegel et al., 2002, Weixelman et al., 1996, 1999). Reaches along Pitch Log have silt to sand banks, where sandbar willow could stabilize a wide reach. There are also examples of mid-seral status willow and cottonwood ecological types along Barnes Valley Creek.

Bank building, as deposition of silt and accumulation of humus, is correlated with status in Gerber's riparian habitats (Riegel et al., 2002). This correlation among plant species and humus as soil carbon, nitrogen, litter, and root mass develops a local understanding of nutrient flows and wetland succession. Silt and humus accumulation on the gravel bars promotes the development of sedge cover among willow in riparian habitats. Bank building is associated with aquifer storage so it may have similar cold water effects as shade, which is the lynch pin water quality element for the State of Oregon.

Ecological Condition

A wide range of habitat conditions were used to identify reference species composition for ecological sites and ecological status (condition) scorecards. The scorecard survey began on the Fremont National Forest in the mid 1990's expanded to adjacent public lands in the late 1990's (Riegel et al., 2002). The scorecard survey identifies and monitors trends in riparian habitats. The twelve draft scorecard ecological types, such as Geyer willow and Nebraska sedge types that occur along streams are often too narrow to form soil survey map units and have been displayed as line map elements (Riegel et al., 2002). The map polygons and line elements complement each other and together better characterize Gerber's landscape.

In the Gerber Block, most rangeland wetlands sites are showing stable or improving trend, i.e. recovery in condition or status. Recent restoration efforts, including construction of structural improvements and implementation of grazing systems designed to promote recovery of these areas, have significantly improved the physical, biological, and ecological condition of a number of riparian areas. It will take many decades, however, to return some of the riparian areas in this survey area to the desired ecological condition (Soil Survey Staff, 2002). On the Fremont National Forest, 22 of 50 proper function condition sites were functional at risk, although most sites were in an upward trend. However, the biological vigor or resilience of mid status functions were lacking in many sites. The recovery is apt to be slowed by the local competition for water in this semi-arid forest landscape with overstocked forest condition.

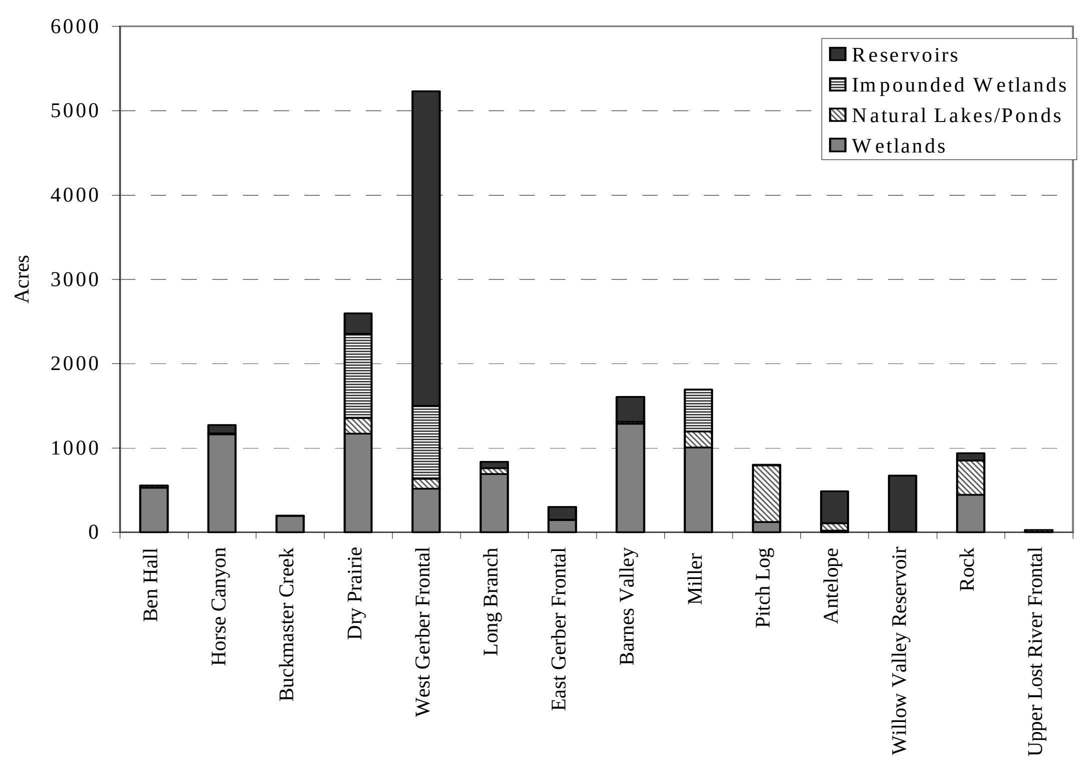
To get at wetland functions, newer research has focused on nutrient flows and food webs. The food webs of aquatic invertebrate communities showed relationship to stream substrate and riparian conditions. In meadow and willow ecological types aquatic diversity varied with ecological status. The highest diversity of invertebrates occurs in mid status willow and aspen ecological types (Kennedy et al, 2000). The stream temperatures also aligned with riparian status on canonical correspondence analysis. So status conditions are apt to be an indicator of "fish" water qualities. In frequently disturbed willow and woody riparian habitats no correlation was found between status and shade, in part because of the spatial complexity of flood deposits (Riegel et al, 2002). The riparian mapping to be conducted in 2003 will help describe and clarify some of these relationships.

Wetland Loss

On a landscape scale, wetland loss is a national conservation issue. It is apt to be the principal issue in the Gerber drainage with altered woodland and forest vegetation structure that competes for a limited water resource. Mapping is an essential part of accurately estimating the areas of wetland loss or gain. In upper watersheds, scattered surveys of riparian and wetland areas have occurred and documented conifer encroachment into wetlands. Pine encroachment has been observed in meadow and aspen / lodgepole pine ecological inventory map units (Soil Survey Staff, 2002). In plant species lists for riparian habitats, ponderosa pine and white fir were ecological mismatches for the saturated soil conditions (Riegal et al, 2002). Plant and soil mismatches were also observed in ecological unit inventory map units on the east edge of the Winema National Forest in habitats similar to Gerber (Soil Survey Staff, 2002). For example on the Fall 2002 field review, ponderosa pine encroachment was observed on a meadow with the Bigtoe soil series. The meadow's present vegetation is Cusick's bluegrass, prairie Junegrass and a diverse list of forbs. The historic plant community is a dry meadow, yet with fire exclusion it has a potential to become a ponderosa pine series. Similarly, the Mighty soil series has scattered ponderosa pine poles in an aspen and lodgepole pine forest with a diverse mix of moist site forbs, such a *Voila, Aquilegia formosa*, and California false hellebore. Scattered ponderosa pines are an ecological mismatch with the mucky mineral wetland features of the Mighty soil series. In Gerber the vernally moist oatgrass ecological type extends into the forest edge (Riegel et al., 2002).

The depositional position where wetlands occur makes them susceptible to losses from inundation by ponds and reservoirs. Construction of dams has impounded wetlands and altered the timing, depth, and duration of flooding in playas and wet meadows. Figure 3-4 illustrates the approximate extent of wetland features in the analysis area. It is not possible to accurately estimate the wetland area inundated by reservoirs. About 550 acres of various wetland ecological types are inundated by Gerber Reservoir alone, and it is likely that wetlands are inundated by other reservoirs such as Round Valley and Willow Valley. Mudflats are exposed when areas with deep water are drawn down (seasonally or during multi-year dry periods).

Figure 3-4. Estimated extent of wetland areas by subwatershed as determined from GIS data.
(Does not including narrow riparian areas associated with streams.)



Construction of low dams has altered the timing, depth, and duration of flooding in playas and wet meadows. In response, vegetation communities in portions of some wetlands have changed. Some former emergent wetlands have been converted to open water habitat types (i.e., lakes and ponds).

Besides construction of dams, other types of modifications have also affected wetlands in the area. These include roads, stockponds, habitat creation projects, and check dams (designed to stabilize stream channels). Such modifications benefit other resources or management programs at the expense of changing the timing and/or spatial pattern of wetland inundation.

Water Quality

Water quality in streams and lakes reflects the range of physical, chemical, and biological processes operating in the upstream watershed. Changes in terrestrial, riparian, or fluvial ecosystems, and consequent alterations in watershed processes, can affect one or more water quality parameters. Water quality, in turn, affects aquatic ecosystems. Due to the spatial and temporal variability of the numerous factors affecting water quality, water quality itself is variable in space and time, and it may be difficult to ascertain the specific cause of water quality problems (Naiman et al., 1992).

Temperature
Water temperature is a key factor affecting the growth and survival of all aquatic organisms. The effect of stream temperature on fish, amphibians, macroinvertebrates, etc. varies between species and within the life cycle of a given species (Lantz, 1971; Oregon DEQ, 1995). Many factors influence water temperature, including landscape position (e.g., elevation, slope aspect, local topography, and distance from headwaters), solar potential (a function of latitude), stream flow patterns, vegetation and stream shading, channel geometry, streambed substrate, and channel-floodplain connectivity. The first two factors are not affected by land management, but the remaining factors may be.

When temperatures reach stressful levels, pockets of cool water provide “refugia” for temperature-sensitive aquatic species. Such refugia, if sufficiently abundant and well distributed, can sustain populations of sensitive species (Sedell et al., 1990). Cool water habitat can be found in deep pools, in the vicinity of cold springs, and at the junction of cooler tributary streams. Effects of water temperature on fish are discussed in the *Aquatic Resources* section.

Habitat modification
Decreased winter flows on streams downstream from reservoirs may adversely affect fluvial processes and fish habitat. Summer reservoir releases are typically “clear” water without any entrained sediment, and do not supply sediment to downstream reaches. As a result, streams can become “armored” with coarse sediment (Williams and Wolman, 1984). Such streams may not adequately support the habitat requirements of various species and of the various life cycles of a given species.

In a more general sense, because fluvial landforms reflect the range of processes occurring in riparian zones and uplands, aquatic habitat can be affected by land uses occurring within the watershed. Causes of habitat modification can then include those actions that alter the supply, transport, or storage of water, sediment, or large woody debris. Individual management actions may not affect watershed processes to the degree necessary to alter habitat, but the cumulative effect of numerous actions may be that watershed processes are substantially changed (Reid, 1993).

Sedimentation

Large inputs of sediment to streams can degrade aquatic habitat. Excess sediment can fill interstitial space (pore space within the stream bed substrate), decrease pool depth and frequency, and change the gradient and plan form of stream channels (Oregon Plan, 1999). Along with bank erosion (discussed in the Stream Channels section), roads are a major source of fine sediment to stream channels.

Sediment production from roads is a function primarily of road surfacing, road condition, and road use. Dirt roads have large amount of available sediment and are typically in worse condition than surfaced roads, and thus produce the most sediment. Sediment delivery from roads to streams requires connectivity between road drainage features and watercourses. Table 3-13 shows the number of road drainage features (lead-off ditches, cross-drain culverts, etc) in each subwatershed that are connected to watercourses. Emphasis is placed on non-engineered features, which as the name implies, are not engineered and therefore can contribute large amounts of sediment (and runoff) to streams.

Roads that cross or are adjacent to streams, or that traverse steep canyon slopes, may present local sources of chronic sediment inputs. Additionally, some roads that cross poorly drained upland areas intercept subsurface flows and concentrate them on roadways. Ditchlines draining such roads may route turbid water into streams (such as where the Mainhaul Road crosses Barnes Valley Creek).

Table 3-13. Road drainage features connected to streams, based on 2002 BLM/USFS road inventory.

	Number of road drainage features hydrologically connected to streams	
Subwatershed Name	Total***	Non-engineered drainages
Ben Hall *	62	37
Horse Canyon	85	39
Buckmaster Creek	32	17
Dry Prairie*	37	23
West Gerber Frontal	22	6
Long Branch	18	10
East Gerber Frontal	29	4
Barnes Valley	131	84
Miller*	23	15
Pitch Log	50	24
Antelope	76	66
Willow Valley Reservoir	30	17
Rock**	67	51
Upper Lost River Frontal**	7	4

* Some private lands within these subwatersheds were not included in the 2002 road inventory; **California portions of subwatersheds not included in the 2002 road inventory. Data supplemented with GTRN data when applicable; ***Total includes low water crossings, ditch relief culverts, water bars, broad-based dips, lead-off ditches, and non-engineered drainages; it does not include constructed stream crossings.

Nutrients and Aquatic Weeds

High nutrient loading, and the prolific growth of aquatic weeds associated with high nutrient loading, can adversely affect aquatic life and recreational use, among other beneficial uses of surface water. In the absence of other limiting factors, excessive nutrient inputs can accelerate the eutrophication of water bodies. Such waters are typified as having an undesirable abundance of plant growth. When this growth dies and decomposes, dissolved oxygen is depleted and un-ionized ammonia can be produced. At elevated levels, un-ionized ammonia can reduce the vigor of, or even kill, fish. High water temperatures can also stimulate excessive plant growth (USEPA, 1999).

Land management actions can increase the delivery of nitrogen and phosphorous to lakes and streams (Owens et al, 1989), although the volcanic and sedimentary bedrock of the assessment area may be partially responsible for high phosphorous concentrations. Phosphorous attaches (‘sorbs”) strongly to soil particles and organic matter and is therefore typically transported in surface runoff. Inorganic nitrogen may be sorbed to particles (though less strongly than does phosphorous) or may be transported as dissolved matter in runoff or groundwater. Relatively minor amounts of nitrogen can be added by atmospheric deposition (EPA, 1999). The altered hydrology of wet meadows and the loss of riparian vegetation due to grazing and channel incision may have reduced the amount of nutrients stored in wetland vegetation and soils (Mitsch, 1995), thus increasing the delivery of nutrients to reservoirs.

Because phosphorous and nitrogen interact with sediment in different ways, they behave differently in lakes. Nitrogen tends to remain within the water column. The particles to which phosphorous is absorbed settle out of the water column over time, causing phosphorous to become unavailable to aquatic plants. Phosphorous may become available as a result of benthic invertebrates stirring up lake-bottom sediments or due to changes in water chemistry. These processes can make phosphorous available for plant uptake long after it enters a water body. This means that even if the supply of phosphorous is reduced, the phosphorous already present can continue to affect reservoir water quality for many years (EPA, 1999).

It should be noted that the water bodies within the analysis area that have high nutrient levels are likely functioning, to some degree at least, as “buffers” for downstream rivers and lakes. While not all of the sediment and associated nutrients that settle out in lakes is completely removed from the system, a substantial portion is, especially in deeper lakes such as Gerber Reservoir.

The State of Oregon’s 303(d) list identifies water bodies that are impaired to the point that beneficial uses (such as fisheries or recreation) are not supported (Table 3-14). Monitoring of water quality parameters by the Oregon Department of Environmental Quality (DEQ), the Forest Service, and the BLM has identified stream segments in the assessment area for inclusion on this list. Water quality measurements were taken on some of the larger reservoirs in the assessment area in 1982 (Johnson et al., 1985).

Approximately 40 miles of streams are included on the 2002 Oregon 303(d) list (Table 3-15) for violations of the 64 F temperature standard for protecting salmonid rearing. Because water quality information is not available for all water bodies in the assessment area, and because almost all of the water bodies for which water quality data is available are included on the 303(d) list, it is reasonable to assume that more streams than are listed are not meeting temperature standards. (Although no new streams were added to the list, the BLM and FS supplied additional water temperature data to the DEQ for use in development of the 2002 303(d) list)

The Upper Lost River is included on the 1998 California 303(d) list for summer temperature concerns. It is likely that the impaired condition of this river segment can be primarily attributed to the quality of water flowing out of Clear Lake, although the temperature of tributary waters originating within the analysis area may exacerbate problems.

In addition to the streams listed for water temperature concerns, on the 1998 303(d) list the DEQ noted that more evaluation of water quality conditions in four reservoirs is needed. These concerns focus on nutrients and aquatic weeds that may be impairing beneficial uses within these waterbodies.

Water Quality Data - Streams

The results of water quality monitoring must be considered within the context of multiple scales of variability. Natural and anthropogenic factors at the scale of subwatersheds, stream segments, and stream reaches can affect water quality parameters observed at monitoring sites, as can differences in the type of water year (wet or dry), the time of day, and the amount of time elapsed since the most recent runoff event.

As discussed above, temperature has profound effects on aquatic habitat quality. All of the stream segments for which continuous temperature data is available had maximum daily temperatures that regularly exceeded 64 F (See Table 3-16.) This threshold was determined to be a biologically significant value, above which trout are stressed (See the *Habitat for Aquatic Species* section for more discussion of water temperature effects on fish).

It is clear that water temperatures throughout the analysis area are high. Some streams not currently on the 303(d) list may be added in the future. That said, the 303(d) lists and the data collected by the BLM and FS may exaggerate the extent of excessively warm streams for three reasons: 1)the data is, in some cases, collected at or near the mouth of the stream, which is typically where water temperatures are highest; 2)listings for the entire length of intermittent streams may not account for distinct seasonal patterns of streamflow; and 3)in some systems, thermal refuges (such as springs or areas where baseflow enters the stream from shallow aquifers) may locally reduce water temperatures (measured water temperatures in springs range from 50 to 70 F).

No water temperature data is available for spring-fed streams on private land (such as Barnes Creek or Casebeer Creek). While water temperatures in these streams are likely lower than in other streams, they may still be adversely affected by land management activities.

Table 3-14. Water quality standards for relevant parameters with numeric standards.

Parameter	Oregon DEQ Standards	California DEQ Standards
Temperature	The numeric criteria for all surface waters in the state is 64 degrees Fahrenheit (F), measured as the seven day moving average of the daily maximum temperatures. If there is insufficient data to establish a seven-day maximum temperature, the numeric criteria shall be applied as an instantaneous maximum. An exception to this criterion is as follows: waterbodies in which salmonid species spawn or rear should not exceed 55 degrees F during the spawning and rearing seasons. Unless specifically allowed under a DEQ-approved surface water temperature management plan as required under OAR 340-41-026(3)(a)(D), no measurable surface water temperature increase resulting from anthropogenic activities is allowed: In a basin in which surface water temperatures exceed 64.0 degrees F; in waters determined by the DEQ to be ecologically significant cold-water refugia; in stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of Threatened and Endangered population; in Oregon waters when the dissolved oxygen (DO) levels are within 0.5 mg/L or 10 percent saturation of the water column or inter-gravel DO criterion for a given stream reach or sub-basin; and in natural lakes.	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of any intrastate waters with the "cold freshwater habitat" designated beneficial use be increased by more than 5 F above natural receiving water temperature. Elevated temperature waste discharges into interstate waters with the "cold freshwater habitat" designated benefic use are prohibited. At no time or place shall the temperature of intrastate and interstate waters with the "warm freshwater habitat" designated beneficial use be increased by more than 5 F above natural receiving water temperature.
Sedimentation	No more than 10 percent cumulative increase in natural stream turbidities allowed.	Turbidity shall not be increased more than 20 percent above naturally occurring background levels.

Table 3-15. Streams included on Oregon 2002 and California 1998 303(d) lists.

Waterbody	Boundaries	Land Status	303(d) Listing
Barnes Valley Creek	River Miles 0 to 14	BLM, USFS, Private	Summer Temperature
Long Branch Creek	River Miles 0 to 4.6	USFS, Private, BLM	Summer Temperature
Horse Canyon Creek	River Miles 0 to 2.2	USFS	Summer Temperature
Lapham Creek	River Miles 0 to 4	Private, USFS	Summer Temperature
Miller Creek	Mouth to Gerber Res. (River Miles 0 to 9.6)	BLM, Private	Summer Temperature
Antelope Creek	River Mile 2 to 3	BLM	Summer Temperature
Upper Lost River	California Segment	USFS, Private	Summer Temperature
Upper Lost River	Oregon Segment	Private, BLM, USFS	Summer Temperature Chlorophyll a[1] Dissolved Oxygen[1] Fecal Coliform[1]

Notes: (1) Listed based on Oregon DEQ water quality sampling conducted more than 35 miles downstream from the analysis area

Table 3-16. Proportion of days between 1 June and 30 September with 7- day moving average of maximum daily stream temperature greater than 64 F (18 C).

Stream	Site	1994	1995	1996	1997	1998	1999	2000	2001	2002
Horse Canyon Creek	HC-4885	72%	45%						100%	
Lapham Creek	LP-5240								67%	49%
Ben Hall Creek				*					*	*
Long Branch Creek	LB-5180		90%	76%						
	LB-5100								89%	79%
Barnes Valley Creek	BV-5160								90%	
	BV-5135	67%	85%	65%	89%					
	BV-4840			75%	100%					
Miller Creek	MR-4760			35%	57%	5%		47%	65%	
	MR-4320				87%		78%	76%		
Antelope Creek	AP-4720			0%						
	AP-4580			52%						
	AP-4530			83%						
E. Branch Lost River	LR-4500								70%	
Rock Creek	RO-4870								75%	66%

*Indicates that data is available for less than one summer month. Instantaneous data for sites in Ben Hall and Pitchlog creeks suggest that temperatures in these creeks also exceed 64 F.

Instantaneous measurements of dissolved oxygen, pH, and turbidity are available for select sites on BLM land (Table 3-17). This data was collected over a range of discharges over the course of many years, and is thus difficult to interpret except in a very general sense. On average, pH shows little variability between sites, although it is highly variable over time. Pitch Log Creek has high amounts of suspended matter throughout its length.

Table 3-17. Summary of instantaneous water quality data.

Stream	Site	Number of Samples	Dissolved Oxygen (mg/L)		PH		Turbidity (NTU[1])	
			Range	Average	Range	Average	Range	Average
Long Branch Creek	LB-5095	4	6.0 - 10.2	7.8	7.2 - 8.3	7.8	1.0 - 4.0	2.8
Pitch Log	PL-3	2	8 - 9.8	8.9	7.4 - 8.6	8.0	6.4 - 21	13.7
	PL-2	2	8.8 - 12.5	10.1	7.4 - 7.9	7.7	6.5 - 22	14.3
	PL-1	5	7.6 - 9.4	8.3	7.1 - 8.6	7.8	1.1 - 18	12.3
Barnes Valley Creek	BV-2	3	5.3 - 9.4	7.4	7.4 - 8.8	8.2	0.55 - 1.8	1.0
	BV-4840	14	7.7 - 10.9	9.4	7.9 -9.2	8.4	0.5 - 19	4.0
Ben Hall Creek	BH-4840	9	5.1 - 10.5	8.1	6.9 - 8.6	7.5	0.85 - 27	5.9
Miller Creek	MR-4760	2	6.9 - 8.4	7.7	7.5 - 8.6	8.1	---	12
	MR-4320	1	---	7.5	---	7.7	---	---
Antelope Creek	AP-4720	4	6.8 - 11	9.2	7.6 - 8.6	7.9	<1 - 1.7	*
	AP-4580	3	8.1 - 8.6	8.5	7.3 - 8.7	8.0	<1 - 2.3	*

[1]Nephlometric Turbidity Units, which are a measure of light scatter within the water column

Note: * indicates that no average was calculated due to questionable data quality

Note: For streams with multiple sites, sites are listed from upper-most to lower-most

Macroinvertebrate Sampling - Streams

In addition to direct measures of water quality, benthic macroinvertebrates (aquatic insects) are important elements of water quality evaluations because they:

- live in, on, or near streambed sediments,
- have relatively long life cycles,
- are sensitive to environmental change, and
- are relatively sessile compared with larger and more mobile organisms (such as fish).

These characteristics ensure that benthic macroinvertebrates (1) respond to natural and anthropogenic environmental conditions that alter streambed sediments; (2) integrate effects over relatively long time periods (months to a year); and (3) characterize effects over a relatively small spatial scale. Variability in benthic macroinvertebrate distributions can be used to assess site-specific water quality over time, or to compare spatial patterns of water quality at several sites (Vinson, 1998).

Benthic macroinvertebrate surveys have been done on BLM streams in the analysis area since 1994. For ease of interpretation, four metrics have been chosen as representative of both species distribution and water quality concerns (Table 3-18).

Overall, measures of diversity (Taxa Richness and Shannon Diversity Index) are fairly constant throughout the analysis area, while measures of abundance and functional feeding group proportion are highly variable. In a very general sense, taxa richness values below 19 indicate moderate impairment, while values less than 10 indicate severe impairment (*Oregon Plan Water Quality Monitoring Guidebook*, 1999). Although the SDI may not accurately reflect the composition of invertebrate communities, for a number of reasons (Kennedy et al., 2000), it is commonly used, and is therefore used in this analysis. The available data suggests spatial and temporal trends for streams in the analysis area. Interpretations must be considered within the context of the limited data set and, more importantly, the fact that macroinvertebrate data does not necessarily reflect subwatershed-scale processes or trends.

Table 3-18. Benthic macroinvertebrate surveys.

Stream	Station	Date	Taxa Richness	Total Abundance	Shannon Diversity	SC : CF Ratio
Long Branch	LB-5095	6/14/96	28	4151	2.141	0.216
		5/20/97	28	3097	2.258	0.664
		7/1/98	18	606	2.329	0.000
Pitch Log	PL-5100	5/11/94	27	556	2.621	0.421
		5/15/97	23	495	2.580	0.234
		5/1/98	17	591	2.278	0.000
Barnes Valley	BV-4840	5/11/93	15	2160	1.616	0.222
		5/11/94	24	7989	2.088	0.396
		6/14/96	28	23766	2.497	0.048
		5/15/97	22	8806	2.147	0.176
Ben Hall	BH-4840	5/11/93	13	1372	2.076	0.012
		5/11/94	20	5348	1.863	0.000
		5/16/96	19	13688	1.153	0.000
		5/20/97	20	4416	1.264	0.000
Miller	MC-4755	7/29/97	20	18104	2.281	0.259
	MC-4320	8/19/97	24	9075	2.436	0.785
Antelope	AP-4725	5/12/93	19	7538	1.776	0.810
		7/17/96	24	52323	1.575	0.912
		7/1/98	21	40555	1.182	0.897
	AP-4580	5/12/93	31	4696	2.780	0.607
		7/17/96	33	38791	2.494	0.356
		7/2/98	28	27760	2.259	0.339
Average Values			23	12540	2.077	0.334

Taxa Richness - The number of distinct taxa usually decreases with decreasing water quality. In some situations organic enrichment can cause an increase in the number of pollution tolerant taxa.
Abundance - The number of benthic macroinvertebrates per unit area is an indicator of habitat availability and fish food abundance. Abundance may be reduced or increased depending on the type of impact.
Shannon Diversity Index (SDI)- Ecological diversity is a measure of community structure defined by the relationship between the number of distinct taxa and their relative abundances. Higher SDI values indicate higher levels of diversity.
Ratio of Scraper and Collector-Filterer Functional Feeding Groups (SC:CF) - This ratio reflects the riffle/run community food base and provides insight into the nature of potential disturbance factors. Scrapers decrease and collector-filterers increase in relative abundance in response to sedimentation and organic enrichment (Vinson, 1992).

The macroinvertebrate assemblages indicate that:

-Between 1994 and 1998, values for taxa richness, SDI, and SC: CF ratio declined in Pitch Log Creek, suggesting recent and perhaps ongoing degradation of water quality.

-Water quality in Long Branch Creek was relatively constant between 1996 and 97, and has declined from 1997 to 1998

-Water quality in Barnes Valley Creek is highly variable.

-Ben Hall Creek has poor water quality, as indicated by an extremely low SC:CF ratio. Instantaneous water quality data show that turbidity in this stream is low, suggesting that organic enrichment may be affecting the SC:CF ratio (does have a fairly low DO). This stream has the lowest SDI of all the streams sampled, below average abundance, and below average taxa richness.

-Water quality in Miller Creek increases from upstream to downstream. This may be a reflection of spring inflows increasing discharge with increasing distance downstream from Gerber Reservoir. The data set for this stream is very limited.

-Water quality in Antelope Creek is generally good, although it degrades with distance downstream from Duncan Springs.

Water Quality Data - Reservoirs

Many of the reservoirs in the analysis area are considered eutrophic – that is, they are biologically productive. Of all the reservoirs, water quality has been well documented in only one – Gerber Reservoir. This reservoir provides habitat for the shortnose sucker and is thus of special concern to the USBR, which between 1991 and 1995 monitored temperature (1991 to 1993), dissolved oxygen (DO) (1992 to 1995), and pH (1992 to 1995) (Piaskowski and Buettner, 2003).

Temperature

Gerber Reservoir is thermally stratified, with fairly stable water temperatures below 1 meter from the surface. Water temperatures at the surface (≤ 1 meter) varied annually from 36 to 72 F, and by up to 8.5 F on a daily basis. In addition, surface temperatures varied spatially across the area of the reservoir. Maximum surface water temperatures occurred from July through September and exceeded 78 F (Piaskowski and Buettner, 2003).

Below 1m, temperatures generally ranged from 37 to 70 F. Daily water temperature fluctuations averaged about 1 F during the summer months. At depth, water temperatures throughout the reservoir were similar (Piaskowski and Buettner, 2003).

Dissolved Oxygen

Dissolved oxygen levels varied with depth and sampling location, as well as between seasons and years. Daily variability was minimal. DO levels decreased with increasing depth, with an average difference of 2.7 mg/L between measurements taken at the surface and at depth (during summer months, this difference could reach 13 mg/L). Seasonally, the DO levels were generally higher in spring and lower in late summer and winter (when levels continuously below 4 mg/L were recorded). DO levels during a given season varied between years, perhaps as a result of varying water levels (Piaskowski and Buettner, 2003). Low DO levels are generally associated with the decomposition of excessive aquatic growth.

pH

pH levels ranged from 7 to 10, with the highest average monthly levels (pH of 9) occurring during summer. pH levels tended to increase throughout the summer months. pH declined with depth during the summer months, and levels did not exceed 9.5 below a depth of 1 meter. During periods when pH was greater than 9.5 at the surface, pH levels were usually less than 8 near the bottom. Higher pH levels at the surface may be related to the photosynthesis by algae (Piaskowski and Buettner, 2003).

Habitat for Aquatic Species

Overview

This section describes the habitat requirements of the species of concern followed by a description of their distribution and relative abundance. Finally, habitat parameters that are measurable and provide an index of habitat condition are defined and their condition in the watersheds described. In section 4 & 5, probable habitat conditions prior to euro-American settlement are compared to the existing conditions. Parameters for this analysis were chosen based their importance as potential limiting factors for the species of concern (namely redband trout and Klamath sucker species) in the watershed.

Selected Parameters:

- Fish passage and distribution.
- Stream temperature
- Spawning habitat
- Habitat complexity (amount of large woody debris and # pools/mi)
- Exotic Species

Life History and Habitat Requirements

Klamath Largescale and Shortnose Suckers

Both Klamath Largescale and shortnose suckers exist in Gerber Reservoir and its tributaries. Because much of the population information collected to date does not distinguish between the two species and their life history requirements are apparently similar, the following habitat requirements are assumed to apply to both species.

Spawning Habitat
For stream spawning populations in the Klamath Basin, suckers begin their spawning migration in late February, March, or early April depending on peak flows and temperature cues, with spawning activity continuing well into May (USDI-FWS. 1993). Spawning surveys conducted on tributaries of Gerber reservoir during the spring of 1993 through 2000 indicate that shortnose and Klamath Largescale suckers typically initiate spawning in late April, the earliest record for spawning as indicated by egg presence was April 17, 2000 (Table 3-19). Egg presence has been identified as late as May 10 in 1995 and 1996. Suckers spawn in a range of water temperatures (9-17C), water depths (11-70 cm), and water velocities (42-132 cm/s) (Buettner and Scoppettone 1990). Spawning occurs near the bottom and when gravel is available; eggs are dispersed within the top several centimeters. Spawning over cobbles and armored substrate, eggs fall between the crevices or are swept downstream. Spawning preference appears to be more related to flow and depth than to substrate type. It is not known how tightly reproductive success is linked to spawning preference.

Larval and Juvenile Habitat
Larval suckers usually spend relatively little time in tributary streams and migrate back to the reservoir shortly after swim up (USDI-FWS, 1993). Larval suckers appear to exhibit a diel migratory behavior and typically migrate during the evening hours. Most larvae migrate to the reservoir between May and June. Larvae surveys of tributaries of Gerber Reservoir during the spring of 1993 though 2000 indicate that native shortnose sucker larvae initiate migration in mid-April and continue into mid-June (Table 3-19). Larvae preferred habitat appears to be pocket water surrounded by rooted aquatic vegetation and they appear to avoid areas devoid of vegetation. Gently sloping, sandy unvegetated shorelines are common today along dikes lining lakes and larger streams. This type of habitat was probably nonexistent historically and such habitats would probably not provide nursery habitats of the same quality as a marsh edge.

Table 3-19. Summary of Gerber tributary sucker spawning surveys 1993-2002.

Year*	**Observations**		**Earliest**	**Latest**	**Comment** (*Survey dates vary between years.)
	Eggs	**Larvae**			
1993	not surveyed	Yes	20-May	15-Jun	
1994	No	No	X	X	A few adults were observed stranded in pools in Barnes Valley Creek in June (only year no reproduction was documented).
1995	not surveyed	Yes	10-May	2-Jun	
1996	Yes	Yes	10-May	4-Jun	
1997	Yes	Yes	17-Apr	X	No surveys in June
1998	not surveyed	Yes	10-May	X	High water in May prevented egg surveys
1999	Yes	Yes	26-Apr	1-Jun	
2000	Yes	Yes	17-Apr	23-May	
2001	No	Yes	21-May	14-Jun	Larvae observed only in the lower reach of Barnes Valley Creek and perennial reach of Long Branch Creek
2002	not surveyed	Yes	X	12-Jun	June 12 was the only survey date

Adult Habitat
Adult sucker spend relatively little time in tributary streams and migrate back to the lake after spawning (USDI-FWS, 1993). A small segment of the native sucker population appears to reside in perennial tributary streams of the Gerber Reservoir (BLM Internal Data). Oxygen depletion can occur under severe ice cover when biological demand depletes oxygen and the ice cover prevents atmospheric gas exchange. Thus, streams could become important refugial habitat when conditions in Gerber Reservoir decline during extended drought.

Klamath Redband trout

Redband trout (a USFS R6 sensitive species, BLM sensitive species, and ONHP vulnerable species) probably entered the Upper Klamath basin from interior connections contemporary with the establishment of the bull trout and the tui chub. After the lake cut an outlet to the Pacific Ocean via the Klamath River, the lake became smaller as the outlet trenched down (Behnke 1992), isolating the Klamath population of redband from the rest of the interior populations.

Redband trout in the Lost River drainage are limited to a few small, scattered populations that are largely limited by restricted habitats (ODFW 1997). Tributaries of Gerber Reservoir support spawning populations that rear in the reservoir. Miller Creek, downstream from Gerber Reservoir has supported a population of redband trout but that stream can become dry in drought years (e.g. 1992).

Trout species are affected by increases in temperature, either by altering feeding behavior or displacement by more tolerant aquatic species. However thousands of years of adapting to a desiccating environment have enabled many populations of Oregon desert redband trout to feed at higher temperatures than most other western trout (Behnke 1992). Native stocks of redband in the Klamath watershed have also evolved resistance to an endemic bacterial disease, (*Ceratomyxa shasta*), which is highly lethal to nonnative trout. The existence of a self-sustaining population of redband in Gerber suggests that the fish present are of native stock as conditions that have occurred since the last stocking of rainbow trout in Gerber Reservoir, spring of 1990, would likely have eliminated strains of introduced trout.

In many circumstances, especially in high-gradient streams, trout abundance may be constrained more by physical habitat than food (Behnke 1992). Trout require four kinds of habitat during the various stages of their life history: spawning habitat, nursery or rearing habitat, adult habitat, and overwintering habitat. Deficiencies in any one of the four will limit production.

Spawning Habitat
All western trout evolved to spawn during the spring season, stimulated by the rising water temperatures (Behnke 1992). However, specific spawning time varies greatly depending on temperature and flow regimes. Native redband trout are iteroparous, spawning more than once in a lifetime, and age of first spawning is likely highly variable based on environmental conditions. All western trout evolved to spawn in flowing waters that circulate dissolved oxygen through the redd (gravel nest constructed by spawning trout where eggs are deposited and covered).

Where spawning gravels are extensive enough, trout can be highly fecund producing far more young than the population can absorb (Behnke 1992). Females can produce 1800 to 2200 eggs per kilogram of female body weight. A stable population can be maintained if only two progeny from each pair of spawning parents survive to reproduce themselves. This leaves a tremendous surplus of young fish expendable to natural mortality.

In the Gerber/Willow Valley system most of the spawning habitat that is available is in intermittent streams and the trout likely use these small tributaries for reproduction. This tactic is successful if the tributary flow is maintained until the young are able to move to the main streams (Behnke 1992). Once the young acquire some swimming facility, declining flow stimulate their downstream movement, and massive losses from stranding are avoided.

Harsh environments can lead to certain reproductive adaptations under specific conditions, such as accelerated embryonic development, ability to spawn and begin egg incubation at temperatures considerable below the norm, could result (Behnke 1992). Gerber trout populations may exhibit these types of adaptations.

Nursery or Rearing Habitat

After hatching and during the first month of life, trout need rearing habitat with protective cover and water of low velocity (Behnke 1992). Such habitats occur along the margins of streams and in spring seeps, side channels, and small tributaries. High gradient, high velocity stream may lack suitable nursery sites, in which case few fish survive to their second year even though spawning success may be high. As with spawning habitat, however, there can be too much rearing habitat. Excessive recruitment into a population where young and adult fish compete for a common food supply results in short-lived, slow growing individuals and a population whose biomass is tied up in small young fish.

The survival rate greatly increases after young trout attain length of 125-150 mm, typically in the second year of life (Behnke 1992). At this stage they relocate to riffle areas; later, they establish territories in deeper waters such as those of pools or undercut banks.

Adult Habitat

By the time they reach adulthood, stream trout generally live at depth of 0.3 m or greater in areas where slow waters for resting are juxtaposed with fast waters that carry food and where protective cover is provided by boulders, logs, overhanging vegetation, or undercut banks.

It is adult habitat that limits the population biomass of resident trout in most streams (Behnke 1992). That is, spawning and rearing habitat are adequate, and the food supply would support a greater biomass of trout if more adult habitat were present.

Over-wintering Habitat

Over-winter survival is related to the amount of deep water with low current velocity and protective cover, such as occurs in deep pools with large boulders and root wads or areas with deep beaver ponds. Most winters in Gerber would be considered severe in nature with most water in the headwaters locked up as ice. Due to the intermittent and flashy nature of the streams and tributaries of the Gerber/Willow Valley watershed little over-wintering stream habitat is available. Most fish would be forced to leave in the fall to over-winter at lower elevations (Behnke 1992), in this case, Gerber Reservoir or the Lost River. An alternative winter refugial habitat would be the spring-fed tributaries of Gerber Reservoir such as Casebeer Creek, Barnes Creek, Lapham Creek, and Antelope Creek

Fish Distribution and Relative Abundance

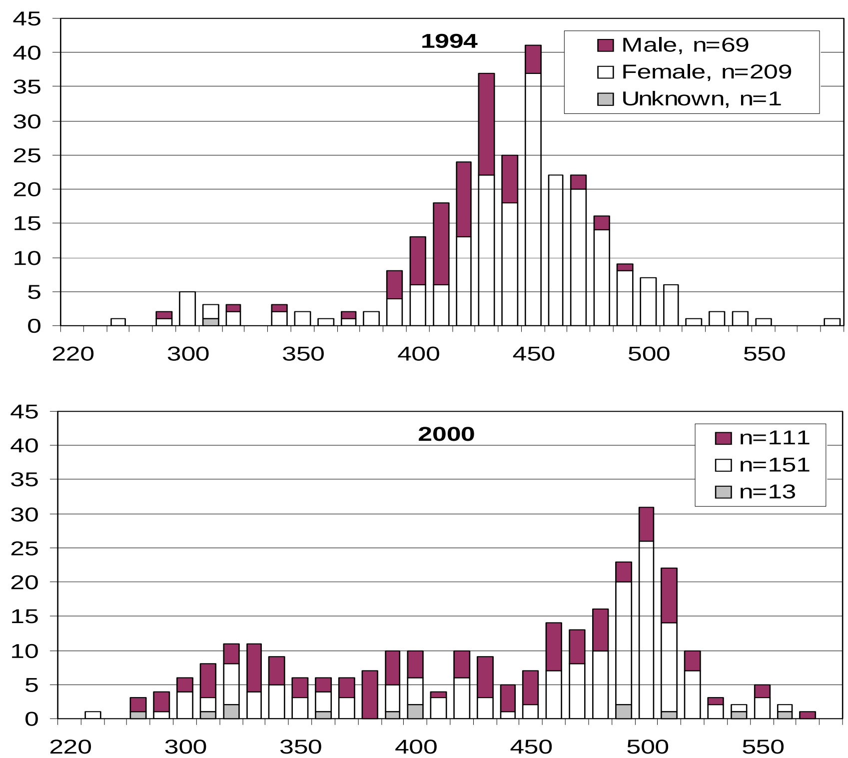
Current fish distribution is mapped (Map 3.1 in Appendix E) as “presence verified” and “presence not verified”. Comprehensive fish presence/absence surveys have not been done in the watershed and therefore absence of a particular species is not displayed. This analysis will focus on distribution and habitat condition of redband trout and Klamath basin suckers. There are no estimates for fish populations in the analysis area; however, there are several sources of information that provide some evidence of population health and viability. A general description of warm-water fisheries is provided because of its importance as a recreational element and potential negative effects of native species if habitat conditions become so favorable for those species that they begin to displace native species.

Gerber Reservoir Fish Populations

Population age structure (Figure 3-5) and relative species abundance estimates (summarized below) are available for suckers in Gerber Reservoir (Piaskowski and Buettner, 2003). USBR has compiled and is in the process of analyzing relevant water quality and fish population data for Gerber Reservoir collected between 1992 and 2000. Effort and sites sampled within reservoir differ between years. USBR collected data for 1992 through 1996. Data for 2000 were collected by USGS Biological Resources Division (BRD). Fish were collected using only trapnets in 1992. Both trapnets and trammel nets were used in all other years to collect fish. Sites sampled within reservoir differed between years. Data for Klamath Largescale suckers and Shortnose suckers is combined and labeled “shortnose sucker”.

Figure 3-5. Length frequency distribution of shortnose suckers by sex from Gerber Reservoir using trammel nets.

Number of fish (indicated by “n”) Fork length class (mm)



The following conclusions were made by USBR in their draft report (2002).

-Low DO levels (< 4 mg/L), occurring at mid- to bottom water column depths in summer and winter, may negatively impact sucker health in Gerber Reservoir. Although areas of higher DO levels were present at shallower depths when stressful levels existed below, it is unknown whether they would be used by suckers.

-Larval and juvenile suckers distributed in near surface waters (< 1 m depth) during some times in summer may be negatively impacted by pH and temperature levels. However below near surface waters, where most suckers > age 0 would be expected, pH and temperatures rarely achieved levels stressful to suckers at anytime of the year.

-Length frequency distributions of suckers collected by trammel nets between 1994 and 2000 were similar, providing evidence of a stable population. However, comparisons should be made with caution since sampling protocols differed between years and other factors cannot be ruled out. For

example, although trammel nets in both 1994 and 2000 were set throughout Gerber Reservoir on a similar number of days (18 and 24, respectively), sampling mostly occurred in June and July in 1994, compared to June through September in 2000.
-Fish were observed to be in poor condition during and following low reservoir/poor water quality years as evidenced by length/weight relationships.

The relationship between length and age of suckers in Gerber Reservoir is unknown. However, if shortnose suckers in Gerber Reservoir grow at similar rates to those found in Clear Lake Reservoir (see Scoppettone and Buettner 1995), then the length of suckers collected from Gerber Reservoir suggest ages ranged from less than one year to about 13 years, with most ages apparently represented in between.

Relative species abundance data suggest that introduced species co-exist with native species although non-natives tend to dominate in fish numbers and probably biomass. Redband trout were observed in only a few occasions throughout the 8-year sample periods suggesting populations are extremely low. Sample methods may be less effective for redband although they are apparently somewhat effective in Upper Klamath Lake despite the target species being suckers.

Other Reservoirs
Other reservoirs in the analysis such as Upper Midway, Antelope Reservoir, Willow Valley Reservoir, and Bumphead Reservoir primarily contain introduced warm water game fish. Angling for these species has become an integral part of the Gerber / Willow Valley opportunities for recreation. Hatchery reared cutthroat trout were stocked in Willow Valley Reservoir up until 1999. Known fish presence of game fish, as of 2000 (Table 3-20).

Table 3-20. Gerber/Willow Valley Watershed reservoirs game fish species presence (P) or absence (A).

Species	Gerber	Bumphead*	Round Valley	Willow Valley	Upper Midway
Lahontan Cutthroat	A	A	A	P	A
Yellow Perch	P	P	-	-	P
Redband Trout	P	-	-	-	-
Pumpkinseed	P	-	-	-	-
Bluegill	-	-	-	P	-
Crappie	-	P	-	-	-
Bullhead Catfish	P	?	P	?	P
Largemouth Bass	P	P	-	P	P
Bull Frog	P	P	P	P	-

*(dry in 2001)

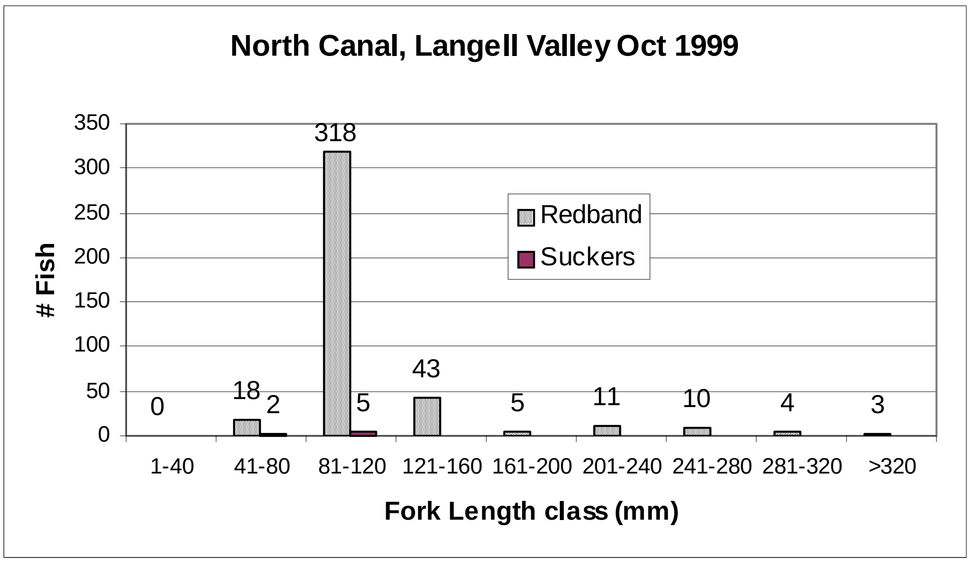
Introduced species such as brown bullheads, fathead minnows, Sacramento perch, yellow perch, pumpkinseed, green sunfish, bluegill, and largemouth bass may become established and abundant in the these smaller waterbodies (USDI-FWS. 1993). USFWS in their 2000 Biological Opinion suggested that predation or competition with small sucker with fatheads, perch and other introduced species potentially could cause limited recruitment of suckers to the reservoir. However, based on population sampling in Gerber Reservoir, most recently in 2000 (Piaskowski and Buettner, 2003), a relatively stable population of suckers coexists with non-native species in Gerber Reservoir.

Miller Creek
Fish population data from Miller Creek is scarce. In the late summer of 1992 Miller Creek was dry throughout most of its 8 mile length. Subsequent spot electro-fish surveys in 1993 revealed no trout or suckers present (R Hicks, memo to BLM file). Since then however, starting in 1995 redband trout and suckers have been observed routinely and a popular trout fishery is apparent. Additionally, a shortnose/ Klamath largescale spawning population has been documented near the mouth of Miller Creek on USBR

easement lands (Mark Buettner, personal communication). Spawning adult shortnose suckers have been observed as far as upstream as Pankey Basin inlet, 5 miles upstream from the Lost River confluence (BLM data). It is not clear to what extent trout or suckers move upstream from the Lost River to Miller Creek or downstream from the irrigation outlet at Gerber Reservoir.

Some information for fish assemblage in Miller Creek can be inferred from fish salvaged by USBR from the main diversion canal which is unscreened at the diversion point (Figure 3-6). About 82 % of these trout were juvenile young of the year. Several other year classes are apparent indicating that some successful recruitment occurred regularly in the mid-1990s. Few suckers were located in Miller Creek in 1999 and all were young of the year.

Figure 3-6. Number of redband trout and suckers captured in the North canal in Oct 1999.



The BLM collected fish assemblage data from a short reach of Miller Creek in 1997 (Figure 3-7). Too few fish (a total of 31) were collected to infer age class distribution although, again, several year classes are apparent. Few young of the year are present. However, fish salvage data from USBR (1999) indicates that young fish may migrate downstream into the canal, possibly when flow decreases as a result of irrigation reduction in October. It should be noted that juvenile redband recruitment and reproduction was associated with high water years only, when Gerber was spilling over the outlet or released for flood control (USBR, 1999). Young of the year fish may not be detectable in April. Reach length was 0.35 mile (25 trout/mile in April; 63 trout/mile in October). Methodology was a single pass electroshock. No block nets were used. This method probably significantly underestimated the true population. Marbled sculpin and speckled dace were also captured in this survey.

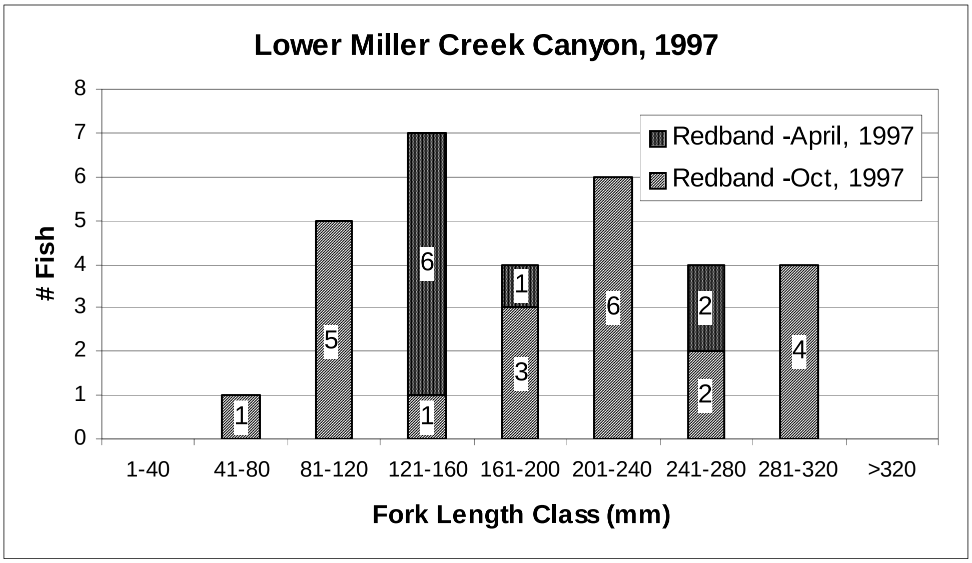
Habitat Conditions - General Descriptions of Waterbodies - Reservoirs

<u>Gerber</u>
Gerber Reservoir was created in 1925 with the construction of a dam on Miller Creek by USBR to store water for agricultural irrigation. The waters of Gerber Reservoir are highly productive and classified as eutrophic. Depth is sufficient to form thermal stratification, which may result in depletion of dissolved oxygen in the lower zones. Water transparency is limited by phytoplankton and suspended sediment. Annual fluctuation in water level and the high turbidity results in very few aquatic plants in the reservoir.

Round Valley

When full, Round Valley Reservoir has about 310 surface acres, maximum depth is only 6 feet and average depth is 5 feet (ODFW 1997). It is fed by intermittent runoff from its 3 square mile watershed. This reservoir is eutrophic. Although water transparency is limited to 2-3 feet, aquatic vegetation grows profusely. Physical cover is provided by emergent vegetation and flooded juniper trees along the shoreline areas. Diversion from Wildhorse Creek provides additional inflow for Round Valley Reservoir. Round Valley Reservoir waters are intended to irrigate the Round Valley Waterspreader.

Figure 3-7. Number of redband trout captured in lower Miller Creek (April and October 1997).



Upper Midway

Size is estimated at 40 acres with depths to about 10 feet (ODFW 1997). The reservoir was built for storage of irrigation waters but not used that heavily. Being shallow it has a high proportion of shoal area that supports growths of emergent aquatic vegetation. Willows growing along the dam provide shade and cover in higher water levels. The BLM does not have legal water rights to this reservoir (see water rights discussion for the affects from drawdown). This reservoir is drained approximately every five years leaving little or no aquatic habitat for fish species, which effectively resets the reservoirs fishery community with no fish present.

Willow Valley

Willow Valley Reservoir was formed by the construction of a dam on East Fork Lost River or Antelope Creek in about 1920 to provide storage for agriculture irrigation (ODFW 1997). At elevation 4526 Willow Valley has a surface area of 588 acres, depth averages 12 feet a maximum of 25 feet, providing a volume of 6800 acre feet. The reservoir is classified as eutrophic with high levels of phosphorus. Water transparency is low because of algae and suspended sediments. Low light penetration retards growth of aquatic vegetation. Flooded juniper trees and rocks provide the primary cover elements. Irrigation and maintenance can virtually dried up the reservoir leaving only the small inflow from East Fork Lost River to provide refugial habitat.

Bumpheads

Bumpheads Reservoir is a small shallow irrigation storage reservoir constructed in 1950 within the watershed of Willow Valley Reservoir (ODFW 1997). At elevation 4740 it has a surface area of 89 acres, its average depth is 8 feet when full and is 15 feet at its deepest point. Inflow is from intermittent surface drainage. Water levels fluctuate from irrigation withdrawals and the reservoir has been dried up in some years of drought conditions. This reservoir is also eutrophic with high biological productivity. Water transparency is limited by suspended sediments and algal blooms.

<u>Dog Hollow</u>
Dog Hollow is another small irrigation storage reservoir (ODFW 1997) with a surface area of 88 acres, a maximum depth of 16 feet, and a total volume of 444 acre feet. No information is available on water quality but it appears to be typical of other small reservoir in the Gerber area, fairly productive but with suspended sediments clouding the water. This reservoir is subject to periodic draining for irrigation purposes.

Habitat Conditions - General Descriptions of Waterbodies - Streams

<u>Miller Creek</u>
Low to moderate gradient, confined in steeper canyon, rocky substrate with few gravels due to reservoir controlled flows. Miller Creek is the outlet from Gerber Reservoir and its flows are subject to the storage and release of waters for irrigation purposes (ODFW 1997). Therefore, this stream typically has its high flows in the summer and is cut off in the winter and spring except for leakage and some ground water that may trickle in within the canyon area. To prevent freezing of the outlet valves during the winter, approximately one to two cubic feet per second is bypassed and released in to the Miller Creek channel (USBR. 1992). The bypass usually begins in November and continues to the beginning of irrigation season. The outlet at Gerber is opened in the spring (approx April 15) to provide irrigation water to the Langell Valley Irrigation District lands (USDI USBR. 1992). The outlet is shut off on or about October 1. Toward the lower end of the creek, the flow is diverted into irrigation canals. Only in periods of spring runoff, when Gerber Reservoir is full, does Miller Creek reach the Lost River (ODFW 1997). Because of low winter flow, complete freezing or ice related anoxia during cold spells might be a problem for fish in Miller Creek.

<u>Barnes Valley Creek, Long Branch Creek, Pitch Log Creek Creeks, Ben Hall Creek</u>
These are the largest streams entering Gerber Reservoir. Low to moderate gradients, low summer base flows, and high peak flows during snowmelt and rain on snow events characterizes the stream environment for fish. These tributaries are important because of their use as the primary spawning habitat for shortnose and Klamath Largescale suckers and redband trout. These streams are best described as “interrupted perennial”**,** that is, some sections of the stream run subsurface during dry periods.

<u>Antelope Creek</u>
Antelope Creek drains a rocky plateau during spring runoff but perennial flow is limited to a 2 mile section fed by Duncan Springs. That perennial segment lies within a rim rock canyon and generally has good cover provided by boulders, shrubs, and trees. This stream flows into Willow Valley reservoir where its waters are stored for irrigation purposes.

<u>East Fork of the Lost River</u>
The East Fork of the Lost River flows from Willow Valley Reservoir five miles to its confluence with the Lost River. The condition of the stream channel between the reservoir and the Lost River is not well known. Fluctuating water levels due to irrigation releases may limit its value as fish habitat.

<u>Rock Creek</u>
Rock Creek is a mix of perennial spring fed sections and intermittent sections. A diversion is present on the stream to provide water to Grohs Reservoir.

<u>Barnes Creek, Casebeer Creek, Lapham Creek</u>
These are small perennial spring-fed tributaries that are capable of providing important refugial cold water habitat during the summer and possibly freeze resistant over-wintering habitat. Their geomorphic tendency to form Rosgen E channel types allows for good depth and cover for fish despite their small relative size (Rosgen 1996). Over the last 10 years, redband trout have been documented in Barnes Creek, Lapham Creek and anecdotal reports of redband exist from Casebeer Creek.

Fish Passage

Road culverts can block the movement of fish; the most common access inhibitors being excessive water velocities and associated vertical drops (Baker and Votapka 1990). When assessing culverts for fish passage, the following parameters should be evaluated: (1) jumping pools, (2) vertical jumps of <1 foot, (3) velocities that do not exceed maximum sustained swimming speed, and (4) culvert length (Furniss et al. 1991). Baker and Votapka (1990) document sustained speeds of rainbow trout being 2.0 - 6.6 feet per second. The criteria for suckers has not been well studied but 4.2 ft/sec sustained speed is suggested. Further, as the water velocity increases, the length of a culvert that a trout can swim through decreases. For example, a trout can maneuver through a 50-foot culvert with water velocities up to 3 feet per second; however, at water velocities of 4 feet per second, a trout can only swim through a 30-foot culvert.

Barriers to fish movement can be **natural** (falls, cascades, dry channels, poor water quality), **man-made** (dams, diversions, and culverts) or a **combination** of natural and manmade causes. For example, if a channel becomes very wide because of human caused streambank degradation, water depth decreases and more flow is required to achieve adequate depth for fish movement. Diversions can cause barriers to fish passage at the point of diversion or areas downstream due to flow reductions. Four culverts blocking fish passage were identified on USFS lands in the Barnes Valley watershed. Watershed impacts that affect the timing and magnitude of runoff such as increased drainage network, or decreased infiltration rates in the uplands can also lead to water quality and flow barriers to migration and fish passage. This can happen when the peak of the hydrograph shifts earlier and results in low flow during the spring when fish are spawning. Refer to Steps 5& 6 for descriptions as to where some of these impacts may be occurring and how they may be inhibiting fish passage potential.

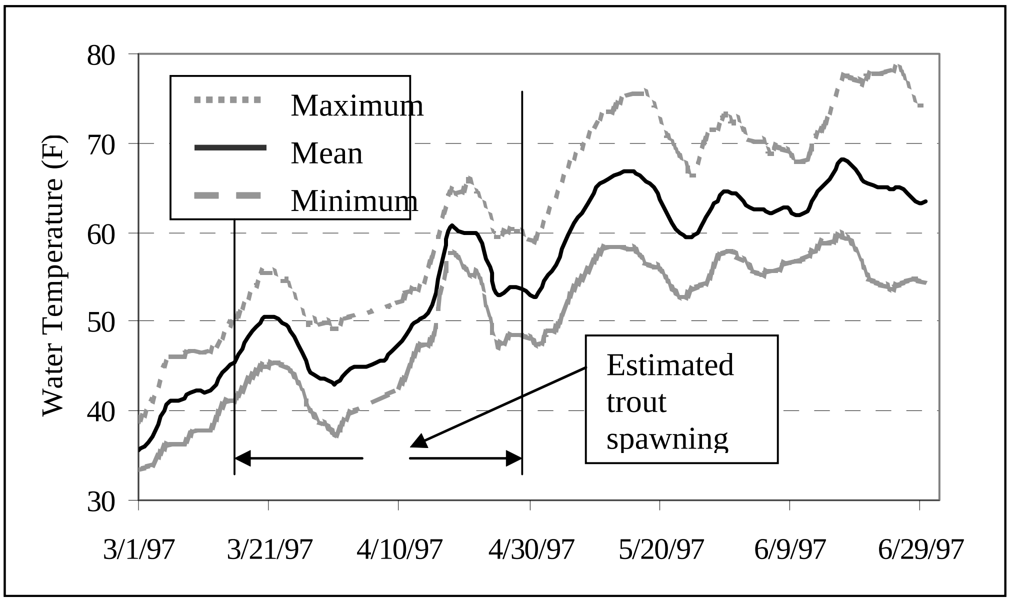
All of the man-made reservoirs that occur on fish bearing streams are fish passage barriers since none have fish ladders or fish screens. Notable among them are Gerber Dam, Willow Valley Reservoir dam, and Dry Prairie on Ben Hall Creek. No road crossings on BLM have been identified as fish passage barriers. Fish passage barriers on Forest Service Lands. Additional road or diversion barriers may exist on headwater/ spring-fed streams on private lands and within Barnes Valley proper. A partial barrier, the low-water ford on the CCC road near the mouth of Barnes Valley Creek was replaced in 2001 and now provides improved fish passage at a greater range of flows.

Casebeer Creek, Barnes Creek, and Antelope Creek in Willow Valley have limited ability to provide even seasonal fish passage when reservoir levels are lower than full pool because of poor channel conditions at the stream mouths (see Figure 5-2, in *Step 5 – Synthesis and Interpretation*). Additionally, a significant proportion of base flow may be diverted for irrigation, which restricts both upstream and downstream migration.

Stream Temperature

Stream temperature is an important factor regulating aquatic life. Fish are cold blooded, and thus, assume the temperature of the water in which they live. For this reason, a fish's metabolism, and consequently their growth and development, are directly controlled by their thermal environment (Brown 1983). Therefore, the growth and survival of fish can be greatly affected by temperature extremes (Beschta et al. 1987). Because stream temperature affects fish habitat, the Oregon Department of Environmental Quality (DEQ) has established a state water quality temperature criteria: 7 consecutive average daily maximum temperatures are to be at or below 17.8°C (64°F) with fish being the primary benefiting resource. Generally, water temperatures in excess of 21°C (70°F) are unfavorable and may cause stress to all age classes (Sigler and Sigler 1991). However, Behnke (1992) states that redband trout possess a hereditary basis to persist at higher water temperatures than other species of trout. This is supported in recent thermal tolerance research conducted in Malhuer and Warner basins (Rodnick et al, 2002 draft manuscript). They found that adult redband trout could tolerate 2-4 °C (3.6-7.2°F) higher acute increase in temperature before experiencing thermal stress than hatchery rainbow trout. Behnke (1992) has captured (fly-fishing) live redband in streams with temperatures of 28.3°C (82.9°F). Temperatures exceeding 29.4°C (84.9°F) can be fatal to rainbow trout (Bjornn and Reiser 1991). It should be noted that desired stream temperatures are discussed in relation to redband trout, since these fish are the only native trout known to exist within the Gerber/ Willow Valley watershed.

Figure 3-8. Seven-day moving average values for maximum, mean, and minimum water temperatures in Barnes Valley Creek upstream from the CCC Road crossing.



Summer stream temperatures were evaluated for their frequency in exceeding the DEQ 64°F criteria (Table 3-16, *Water Quality* section). In lower Barnes Valley Creek the standard was exceeded between 74% and 100% of the days between June 1 and September 30 for the seven years of record. An additional stream temperature problem encountered by fish in the watershed is high water temperatures associated with low flows in the early spring. DEQ has suggested that 55°F is needed for salmonids during spawning and incubation periods (Table 3-14, *Water Quality* section). This standard is frequently exceeded in Barnes Valley Creek and probably in Miller Creek before irrigation is turned on in April and early May when trout would likely be spawning. Figure 3-8 (above) shows the seven-day moving average values for maximum, mean, and minimum water temperatures in Barnes Valley Creek upstream from the CCC Road crossing - site BV4840. (USBR inflow data indicates that Barnes Valley Creek streamflows were below average in the spring of 1997.)

Large Woody Debris (LWD) and its Contribution to Fish Habitat

Large woody debris in streams is an important roughness element influencing channel morphology, sediment distribution, and water routing (Swanson and Lienkaemper 1978, Bisson et al. 1987). Large wood can form a step gradient, a stair-step effect along the channel. As a result, stream velocity is reduced in the relatively long stretches between debris steps and increases where water falls over the logs. A straight stream will be converted into a more sinuous or meandering stream with the LWD (Swanson 1991). These alterations in flow patterns may either protect or erode banks, but in general, this energy distribution reduces the streams ability to erode banks and enhances sediment storage (Zimmerman et al. 1967). Wood also serves as an important agent in pool formation. The resulting effect on fish habitat is significant. Large wood in the low energy segments traps organic matter such as leaves, which remains in the stream longer, providing food for aquatic organisms (Speaker et al. 1984). Reeves et al. (1991) notes that low velocity areas required by fish—during floods—increase with additional LWD. Bjornn and Reiser (1991) cited several studies that documented an increase in fish densities with higher levels of LWD. It should be noted that the role of LWD decreases as streams become larger, because greater currents will carry the wood out of the active channel and onto the banks (Murphy and Meehan 1991).

Large woody debris information was collected in selected streams in the Gerber watershed by ODFW survey crews in 2001. Data from two streams, Barnes Valley Creek and Miller Creek is presented in Table 3-21. In streams where LWD is lacking, large boulders (>1.4 ft diameter) can function as coarse roughness features. They provide cover, promote scour features, and reduce water velocity (ODFW 1997). In Step 5, this data will be compared to LWD data for near reference condition values suggested by Quigley et al (1997).

Table 3-21. Large woody debris and large boulders expressed as number of pieces/mile.

Stream Name	Reach #	Reach Length (mi)	Slope Class (%)	Stream Width (ft)	Large Wood (pieces > 20 in diam/mi)	Large Boulders (>1.4 ft diam)
Barnes Valley	1*	0.4	<2%	49.2	0.0	209
	2	2.4	<2%	32.8	6.4	1304
	3	2.7	<2%	19.7	1.6	80
	4	0.5	<2%	26.2	0.0	0
Miller Creek	1	1.2	<2%	52.5	12.9	1625
	2	3.4	2-4%	52.5	9.7	2784
	3	2.7	<2%	62.3	14.5	2028

*reaches were within in the full pool area of reservoirs and therefore their condition was influenced by the reservoir

Pools and their Contribution to Fish Habitat

Pools are considered to be one of the most important fish habitat features, and for most fish, pools are the preferred habitat type (Bestcha and Platts 1986). Reeves et al. (1991) describes some of the reasons why trout use this habitat type: pools offer low velocity refuges, cooler stream temperatures during the summer months and over-wintering habitat. Furthermore, the majority of trout spawning occurs at pool tailouts, where spawning gravel is deposited (Bjornn and Reiser 1991, Reeves et al. 1991). In addition, pools provide rearing habitat for juvenile fish and resting habitat for adult fish (Bjornn and Reiser 1991), and refugia from drought, fire, winter icing and other disturbances (Sedell et. al. 1990). When pool numbers, volume, and complexity increases, the stream's capacity to support a diversity of species and life stages/history types increases (Bisson et. al. 1992; Bjornn and Reiser 1991). Further, Decker and Erman (1992) found that rainbow trout numbers were more abundant with an increase in pool habitat. Finally, an increase in pool numbers and complexity produces conditions for increased fish numbers and biomass (Fausch and Northcote 1992). Table 3-22 presents pool frequency data for 3 streams (BLM, 1997 and ODFW, 2001). In *Step 5 - "Reference Condition"*, values are compared to research information from the northern Great Basin (Quigley et al, 1997).

Table 3-22. Number of pools per mile in Barnes Valley Creek, Miller Creek and Antelope Creek

Stream Name	Reach #	Reach Length (mi)	Slope Class (%)	Stream Width (ft)	Pool w/d ratio
Barnes Valley	1*	0.4	<2%	49.2	7.9
	2	2.4	<2%	32.8	9.2
	3	2.7	<2%	19.7	5.8
	4	0.5	<2%	26.2	7.7
Miller Creek	1	1.2	<2%	52.5	13.9
	2	3.4	2-4%	52.5	12.7
	3	2.7	<2%	62.3	22.0
Antelope	1*	0.2	<2%	4.3	8.1
	2	0.2	<2%	6.0	7.9
	3**	1.0	<2%	5.6	7.0
	4**	1.0	<2%	7.9	7.1
	5	0.3	<2%	14.8	9.9

*reaches were within in the full pool area of reservoirs; therefore their condition was influenced by the reservoir
**reaches were used for the "Gerber\Willow Valley reference condition"

Another pool attribute that can be useful for evaluating habitat condition and value as fish habitat is pool width to depth ratios (Table 3-23 from BLM, 1997 and ODFW, 2001). Values are compared to research information from the northern Great Basin (Quigley et al, 1997).

Table 3-23. Pool width/max depth ratios for Barnes Valley Creek, Miller Creek and Antelope Creek

Stream Name	Reach #	Length (mi)	Slope Class (%)	Width (ft)	Pool w/d ratio
Barnes Valley	1*	0.4	<2%	49.2	7.9
	2	2.4	<2%	32.8	9.2
	3	2.7	<2%	19.7	5.8
	4	0.5	<2%	26.2	7.7
Miller Creek	1	1.2	<2%	52.5	13.9
	2	3.4	2-4%	52.5	12.7
	3	2.7	<2%	62.3	22.0
Antelope	1*	0.2	<2%	4.3	8.1
	2	0.2	<2%	6.0	7.9
	3**	1.0	<2%	5.6	7.0
	4**	1.0	<2%	7.9	7.1
	5	0.3	<2%	14.8	9.9

*reaches were within in the full pool area of reservoirs; therefore their condition was influenced by the reservoir
**reaches were used for the "Gerber\Willow Valley reference condition"

Spawning Gravel Fines and their Influence on Fish Habitat and Reproductive Success

Willers (1991), describes the effects of spawning gravel size on egg and alevin survival (hatched fish that have not emerged from spawning gravels). In general, he states mortality increases as spawning gravel size decreases because fine sediment impedes the flow of oxygenated water over the eggs or can trap the alevins in the gravel. Likewise, other studies show an inverse relationship between fine sediment and reproductive success (Everest et al. 1987). Bjornn and Reiser (1991) documented rainbow trout embryo survival as it related to substrate fines <6.4 mm: 90% embryo survival with fines at 10%, 75% embryo survival with fines at 20%, and 50% embryo survival with fines at 30%. In general, habitat guidelines for incubation of salmonid embryos require less than 25% volume of fines.

Substrate composition in riffles was evaluated by visual estimation methods (ODFW 1997) in the ODFW stream habitat survey (2001). This methodology is known to underestimate the proportion of fines comprising the bed material. Pebble count methodology was used to estimate percent fine substrate in

Antelope Creek (BLM 1997). While this method is more quantitative, it still underestimates the proportion of fines in comprising the bed material because material on the surface is generally larger than in the subsurface (i.e. armoring). Bulk sieve analysis of the surface and subsurface is a more accurate and appropriate methodology. Based on this information and current literature (Quigley et al, 1997), desired conditions for spawning substrates are evaluated in Steps 5 & 6. Table 3-24 includes data on relative composition of fine substrate (<2mm diameter) and gravel (2mm - 64mm) in riffles for survey reaches in three streams.

Table 3-24: Percent fine substrate (<2mm diameter) in and percent gravel (2mm - 64mm) in riffles for survey reaches.

Stream Name	Reach #	Length (mi)	Slope Class %	Width (ft)	Fines in Riffles %	Gravel in Riffles %
Barnes Valley	1*	0.4	<2%	49.2	5.0	20.0
	2	2.4	<2%	32.8	7.0	25.0
	3	2.7	<2%	19.7	x	x
	4	0.5	<2%	26.2	x	x
Miller Creek	1	1.2	<2%	52.5	1.0	12.0
	2	3.4	2-4%	52.5	5.0	35.0
	3	2.7	<2%	62.3	7.0	19.0
Antelope	1*	0.2	<2%	4.3	35.5	32.6
	2	0.2	<2%	6.0	14.4	37.7
	3**	1.0	<2%	5.6	14.9	26.3
	4**	1.0	<2%	7.9	9.2	18.5
	5	0.3	<2%	14.8	10.5	31.9

*reaches were within in the full pool area of reservoirs; therefore their condition was influenced by the reservoir
**reaches were used for the “Gerber\Willow Valley reference condition”

II. Vegetation

Forested Uplands

Ponderosa Pine

Ponderosa pine forests cover approximately 67,000 acres of the Gerber/Willow Valley watershed, which is 24% of the total area. It is the most widespread forest community type. Ponderosa pine is well adapted to warmer and drier sites, and forms the first forests above the valley floors and juniper woodlands. Most stands are found between 4800 to 5400 feet elevation. At lower elevations, and rocky stand edges, western juniper mixes with the pine. At higher elevations, white fir can be a minor stand component

Overall, ponderosa pine stands are relatively densely stocked with small diameter pine, with juniper invading lower elevation stands, and white fir seedlings becoming established at higher elevations.

The ponderosa pine community types can support a significant shrub component. Big sagebrush, antelope bitterbrush, and mountain mahogany are common on lower to moderate elevation sites. Greenleaf manzanita and squawcarpet can be found on higher elevation sites. The shrub layer can cover 60 to 70% of the area. The herb-grass layer is highly variable with a diverse number of species occurring throughout the area.

The mean stand productivity is highly variable depending on stand density and site quality. Ponderosa pine forests generally have relatively low to moderate productivity. Mean wood productivity ranges from 42 to 54 cubic feet per acre per year.

Condition of the ponderosa pine forests can generally be summarized by:

- increased stand density and overstocking due to fire exclusion,
- increased stand complexity (layers), and more ladder fuels,
- decreased stand vigor and resiliency (positive response to disturbance events),
- increased vulnerability to insect attack,
- increased ground and standing fuels, and
- increased risk of stand-replacing catastrophic wildfire.

Disturbance Agents in Ponderosa Pine Forests

1. Fire Ecology

Dramatic changes in stand structure and species composition, over the last 150 years, can be attributed to fire exclusion, historical grazing practices, and timber harvest. Fire has played a dominant role in the development and structure of ponderosa pine stands within the Gerber-Willow Valley WA Area, as it has across the entire West. (Fire's historical role in stand development is also discussed in Steps 4 and 5). Fire history studies in Oregon's ponderosa pine forests show a fire return interval of 3 to 50 years, depending on site conditions and weather patterns (Agee 1993). In general, higher elevation sites, or sites on the fringe of mixed-conifer forests, usually had longer fire-free intervals compared to drier, lower elevation sites. Local investigations for the Gerber area indicate a fire return interval of 8 to 12 years (USDI, 1994). These naturally occurring fires were normally low-intensity burns that consumed ground fuels and kept the forest floor relatively free of fuels and brush.

The process of stand development in ponderosa pine forests is a function of shade intolerance of ponderosa pine, periodic good years of seedling establishment associated with years of above normal precipitation, and frequent fire (Agee 1993). Gaps in the forest created by insects, wind, or disease, and cleaned by periodic natural fires, allow pine to seed in and become established in openings. In these areas, young trees are protected from fire due to light fuel loads on the forest floor. As the trees in the openings develop, and continue to grow, they begin to shed needles and limbs to build up sufficient fuel to carry natural fire and thin out the stand. These groups of younger trees grow to canopy level and can maintain codominance for very long periods of time. What looks like an open "park like" even-aged and single-storied stand, can actually be composed of groups of trees of varying ages. The age of codominants in a stand can vary from 150 to 500+ years old. Multi-aged stands are commonly composed of a mosaic of small groups, or patches of even-aged pine. In this case, the multi-aged structure is found on a horizontal basis, rather than vertically on every acre.

Over the last 150 years, fire suppression has allowed the establishment of multistory structures under old growth pine. Where timber harvest has removed the old growth component, residual stands are mid seral pole sized trees. Current conditions (dense stands with a variable age class and ladder fuels, and a large accumulation of ground fuels) have increased the likelihood of large scale, stand-replacing wildfires, like the Kitts Mill Fire of 1987. Assuming a fire return interval of 8 to 12 years, most untreated stands have missed about 12 natural underburns, and currently carry a heavy accumulation of fuels as a result. Another result of fire exclusion has been the invasion by western juniper at lower elevations and dry edges, and by white fir in higher elevation stands.

Prescribed fire, mainly to reduce fuel accumulations, was first implemented around 1980 by the Fremont N F and the BLM. More recently, cooperative burns have been made in the Paddock Butte area, involving the Fremont N F, BLM, and a private landowner. Industrial forestlands within the WA area have not undergone prescribed burn treatments.

2. Insects

Western pine beetle, mountain pine beetle, pine engraver, and red turpentine beetle are the major insects affecting the ponderosa pine forests. They usually attack trees weakened by other causes, like drought stress.

Under normal conditions, beetle populations remain at a low endemic level, but increase sharply when stand condition is weakened.

Western pine beetle typically attacks individual large pine weakened by moisture stress. Moisture stress is usually caused by excessive stand density, especially where dense understories are found below the larger trees. In recent years, only limited mortality caused by western pine beetle has been detected.

Mountain pine beetles typically attack overstocked sapling/pole sized stands, and kill single trees, or groups to 1/4 acre in size or larger. Dense stands, with stressed trees, are at highest risk. Mortality typically rises to high levels during and following extended drought periods. Stands having reduced densities through thinning or underburns are more resistant to mountain pine beetle attack.

The pine engraver bark beetle also attacks smaller trees, logging slash, fire-killed trees, windthrows, and the tops and limbs of trees killed by other beetles. During severe outbreaks, pine engraver beetles can group-kill parts of stands like mountain pine beetle.

The red turpentine beetle causes the least damage of the four bark beetles, but can kill trees after repeated attacks. More often, it attacks injured, weakened, or dying trees, and further weakens them, making them more vulnerable to attack by other bark beetles.

3. Disease

Annosus root rot is a major disease in the area. The P-strain of the fungus causes the disease that affects ponderosa pine. Windborne spores germinate on freshly cut stumps and spread to the roots, and to the roots of adjacent live trees through root grafts. Ponderosa pine and western juniper are the species susceptible to the P-strain of this disease. Individual infection centers can radially spread outward until host material is no longer available. Stand gaps, or openings of varying sizes are a legacy of this disease. Infection levels are high on more marginal sites and compacted soils, especially at lower elevations of the WA area.

Ponderosa pine dwarf mistletoe is a species-specific plant that infects only ponderosa pine. It causes growth loss, can kill smaller trees, and often weakens trees enough to make them vulnerable to bark beetle attack. Spread and damage is greatest in pure ponderosa pine stands with multi-layered canopies.

Comandra blister rust causes only minor mortality, but often kills the tops of larger trees. These “spike” tops often provided the only long-lasting snag habitat in pre-settlement forests, where “whole-tree” snags burned every few years.

Locally, windthrow can create stand openings that change the structure of the pine stands.

4. Management

Early “management” of the ponderosa pine forests began in the 1870’s, when local and transient livestock operators began utilization of the unfenced ranges. Cattle, horses, and sheep (up to 20,000 head per band) heavily grazed the range, and reduced the amount of ground fuel that “carried” periodic light natural ground fires. In addition, active fire suppression by all landowners began after 1900. While well intentioned, the full suppression of fires has allowed the expansion of juniper from more natural rocky, low fuel sites, to adjacent range communities and pine stands. White fir (and pine) seedlings, which would formerly have burned in periodic ground fires, have been allowed to grow into the dense pole and saw timber stands now found in many ponderosa pine stands. In the 1960’s, precommercial thinnings were begun in younger stands on national forest and BLM lands, to reduce stand densities for improved growth, as well as increased resistance to insect attack. Since the late 1970’s, prescribed underburns have been done on national forest, BLM, and private lands, to reduce the excessive fuel loads to lower, more natural levels, and reduce the risk of stand-replacing wildfires.

Management of the commercial-sized pine stands has varied with the landowner in the Gerber/Willow Valley WA area. Until about 1998, Weyerhaeuser Company owned much of the industrial private lands in the WA area. (In 1998, they sold their lands to U.S. Timber Company, who in turn have sold a portion of these lands to Jeld-Wen, Inc.). From about 1930 to the 1970's, these private lands were logged, mainly to remove the large, old-growth ponderosa pine. Depending on markets, other species and smaller pine were sometimes also removed. Early logging tended to leave the dense understories behind, while later even-aged practices resulted in clearcuts and establishment of extensive ponderosa pine plantations.

On the Fremont National Forest, timber harvest up to World War II was limited to small operations. After World War II, timber harvest increased, and concentrated on removing large, old-growth pine. (Higher quality boards milled from ponderosa pine were used for non-structural applications, like window frames, doors, and furniture. Most of the logs ended up as boxes for California fruit and vegetable growers). In the 1970's and 1980's, management shifted to extensive overstory removal of large pine, to help release understories, which often were precommercially thinned after. In the late 1980's, clearcutting was also done to a limited extent. Since the early 1990's, harvest levels have been drastically reduced, in response to management direction to protect other resource values.

Public lands in the "Gerber Block" were first managed to control cattle grazing, under the Taylor Grazing Act of 1934 (Beckham 2000). Crews from CCC Camp Bonanza worked on range projects in the Gerber Block, and also built and improved existing roads of the time. Negligible timber cutting in the pine stands took place until after 1947. That year, the Materials Sales Act authorized cutting of green timber on public lands. The newly formed Bureau of Land Management (1946) then began a timber management program in 1948 that focused on the salvage of mortality volume and establishment of a permanent road system for future treatments. Since about 1968, subsequent entries have been made with the goal of maintaining the multi-aged structure of the stands, especially maintaining the larger trees. Timber harvest concentrated on individual tree selection of larger, high-risk trees, limited overstory removal where adequate pine understory is present, and commercial thinning of the understory. Reserving part of the old-growth component has allowed retention of a multi-aged stand structure. (However, the number of large pine would not be enough to meet Hopkins' old-growth definition criteria). The multi-aged structure is typically "horizontal" on a stand basis, where the stand is composed of a mosaic of small clumps of varying ages and sizes. Underburning has been extensively applied to the BLM pine stands and nearly all have been treated at least once since 1980.

White Fir/Mixed Conifer

White fir and white fir/ponderosa pine mix conifer cover types exist as scattered polygons throughout the Gerber Watershed where site conditions allow for the development of white fir. Site conditions favorable for the development of fir include sheltered locations and low energy aspects (north to east) at lower elevations (less than 5,500 feet), and all aspects above approximately 5,500 feet in elevation where soil development and disturbance history permit. Approximately 7,700 acres are included within these two cover types, representing about 3 percent of the watershed.

Associated species in these cover types include incense cedar and lodgepole pine. These species are normally subordinate to the white fir or white fir/ponderosa pine mixed forests.

At lower elevations, white fir is usually subordinate to ponderosa pine and normally exists in the lower canopy levels. This situation is most evident at the ecological limits of white fir regeneration and establishment. This situation usually develops due to a combination of (1) successful fire suppression, which removes an efficient mortality agent of white fir seedlings/saplings and (2) plant succession (temporal changes in both species abundance and vegetation structure) as environmental conditions are modified by increased canopy closure in the upper canopy, resulting in favorable conditions for the establishment, growth and development of white fir.

As site conditions become more favorable for establishment and development of white fir either through increases in precipitation (upper elevations with adequate soil development), or decreases in evapotranspiration (protected lower elevation sites), white fir exists throughout the canopy. Pure white fir stands exist at the upper most elevations (Horsefly Mountain), but generally ponderosa pine occurs as a co-dominant. The actual abundance of species within this type correlates to disturbance history, cone periodicity and seed fecundity and other site factors.

1. Fire Ecology

The fire regimes affecting mixed conifer forests across the west are highly variable. Historical fire return intervals within true mixed-conifer forests are probably between 25 and 75 years. Where white fir occurs with ponderosa pine, fire-return intervals are probably at short end of the range. In the lodgepole pine/white fir associations, the fire-return interval is probably on the longer end of the range. As fire return intervals lengthen, likely due to cooler, wetter climate, there is a tendency to have higher proportions of white fir in the overstory (Agee 1993).

Ponderosa pine has a competitive advantage in the presence of fire that it loses in a fire free environment. Today most mixed conifer stands in the Gerber/Willow Valley watershed exhibit abundant white fir in their understory. The fire free period experienced this century has caused mixed conifer stands, which evolved similar to open ponderosa stands, to become dense stands of true fir with unprecedented stocking levels. As a result, fires that were historically a maintenance event would today likely be a high intensity stand replacement event.

2. Insects

In addition to the insects that affect ponderosa pine, fir engraver beetle, Modoc budworm and the Douglas-fir tussock moth are important insects that affect white fir. Although threats by insects and diseases seem numerous, they tend to be species specific. Mixed conifer stands typically provide a greater resiliency to insect attack than stands that are composed of a single species.

The fir engraver beetle is an opportunist that will attack and kill white fir under stress (Eglitis, et al. 1993). Periods of drought generally correlate to beetle attacks within the Gerber watershed. The stands at highest risk are those occupying sites at the drier fringe of their range.

The Modoc budworm has a small natural range between NE California and SE Oregon. The insect is considered to be less aggressive than the western spruce budworm with sporadic outbreaks that haven’t caused severe damage to host stands. The Modoc budworm is not a primary mortality agent. In extreme cases, trees can be totally defoliated. The weakened tree then succumbs to more aggressive agents such as fir engraver (Eglitis, et al. 1993)

Information on current distribution in the Gerber Watershed is not available, though it is not uncommon to find the larvae feeding on white fir foliage. There has never been a reported outbreak to the extent that trees had been severely defoliated. Due to fire exclusion, host stands have been increasing across the landscape. The stands at highest risk are those multi-story stands, heavy to white fir, under stress from density or drought.

The Douglas-fir tussock moth has potential to be an important insect within white fir stands. Annual “early detection” monitoring has yet to detect harmful population levels on the Fremont NF, nor has there ever been a documented outbreak on this forest.

3. Disease
Because ponderosa pine in an integral species in mixed conifer stands in the Gerber watershed, Annosus and Armillaria root disease, and dwarf mistletoe are important diseases to these stands. In addition, Indian paint fungus is an important stem decay pathogen in white fir.

S-strain Annosus, which infects only white fir, has been documented throughout the Fremont NF including the Gerber watershed. Multiple entries within stands of high white fir composition tend to aggravate the occurrence of this root disease.

Armillaria root disease prefers white fir to pine. Though probably present within the Gerber watershed there are no documented infection centers.

There is a species of dwarf mistletoe that infects only white fir. Due to the fact that white fir has expanded its presence so quickly across the landscape, this mistletoe is not distributed as widely as the ponderosa species. Information on current distribution in the Gerber watershed is not available.

Indian paint fungus affects only white fir within the Gerber watershed. Most infections enter through small branch stubs, or other entry points from wounds or mechanical damage. Once the infection point heals, the fungus remains dormant for up to 50 years or longer. Death of large branches, mechanical wounds, insect patch kills, and fire scars appear to activate dormant fungus infections (Aho 1981). The percentage of trees which are of less commercial value as a result of these pathogens varies widely from drainage to drainage but can run as high as 30 to 50 percent. Fir damaged during management activities runs the risk of accelerating development of these decays and will likely lead to substantial decay losses by Indian paint fungus and others. It is thought that mechanical wounds today play the same role as fire scars had played historically in initiating stem decays in white fir (Aho 1981). Information on current distribution in the Gerber Watershed is not available.

4. Management
Management within the mixed conifer stands began much as it had with the ponderosa pine type. Protecting and capturing mortality of the valuable mature pine was paramount. By far, most of the intensive forest management practices occurring on the Fremont NF were implemented in these relatively productive mixed conifer types. Due to the management imposed fire free period partial overstory removals became practical and common. Valuable ponderosa was harvested and the fast growing white fir understory was treated as advanced regeneration thus avoiding the cost of artificial regeneration. Many of these areas have had a pre-commercial thinning treatment completed. Recently (mid-1990's), salvage harvest has become common in an attempt to capture mortality created by the fir engraver.

Even-age regeneration methods were also used, particularly in the 1970's and 1980's. Approximately 7600 acres of plantations have been created. Just as in the ponderosa pine types, these plantations were planted at high stocking levels, and would require pre-commercial thinning if large tree diameters and lower stocking densities are desired.

To date on the Fremont NF, very little prescribed underburns have occurred in mixed conifer types because of the sensitivity that white fir and incense cedar have to fire. The natural fuels underburn project plan addressed only treating ponderosa pine types.

Western Juniper Woodlands - (Also see discussion under Non-Forested Uplands)

Western juniper (*Juniperus occidentalis*) appears to have undergone major expansion within its range during the last 100 – 150 years. Post-settlement expansion of juniper woodlands is considered unprecedented when compared to prehistoric expansions during the Holocene period (Miller and Wigend 1994). Juniper woodlands have expanded as much as 5 to 10 times in area and 2 to 20 times in density (Burkhart and Tisdale

1976, Tausch et. al. 1981, Miller and Rose 1995 & 1999). A majority of this expansion has occurred in the more productive mountain big sagebrush cover type. However, western juniper has also been actively encroaching into aspen, curl-leaf mountain mahogany and riparian communities below 7,000 feet in the northwestern portion of the Great Basin (Miller and Rose 1995, Wall et. al. 2001).

The factors most frequently attributed to the increase in both area and density of juniper are climate, the introduction of livestock (1860 – 1870s), post-industrial increases in CO2, and reduced role of fire.

Climate- From 1850 to 1916 winters became milder and wetter than the long-term average across much of the Great Basin. This wet period coincides with the initiation and peak period of current woodland establishment.

Livestock - The introduction of livestock during the 1860s and the large buildup of animals from the 1870s to early 1900s coincide with the initial expansion of juniper woodlands in the northwestern Great Basin. Domestic grazing likely influenced juniper expansion through the reduction of fine fuel loads, which significantly altered the fire regime (Campbell 1954, Ellison 1960, Burkhart and Tisdale 1976, Miller and Rose 1999).

Atmospheric CO2 - Rising levels of atmospheric CO_2 have also been cited as causing the increase in woody species throughout the West (Knapp and Soule 1996). The rise of the modern industrial development and the initiation and peak period of current woodland establishment do overlap each other by time period. However, the influence of rising atmospheric CO_2 levels on the peak initial increase of juniper, tree growth or the competitive relationship between trees and understory species are not well understood.

1. Fire Ecology

Fire is considered to be the most important factor in maintaining shrub steppe communities and open juniper savannas prior to Eurasian settlement (West 1999) Limited data exist describing fire histories across the shrub steppe communities and woodlands of the Great Basin. Unlike ponderosa pine, juniper seldom scars repeatedly (Gruell 1999, West 1999); thus it is difficult to develop fire histories for juniper woodlands. Old growth juniper trees are commonly found on relatively fire safe sites characterized by rocky surfaces with limited fuel loads.

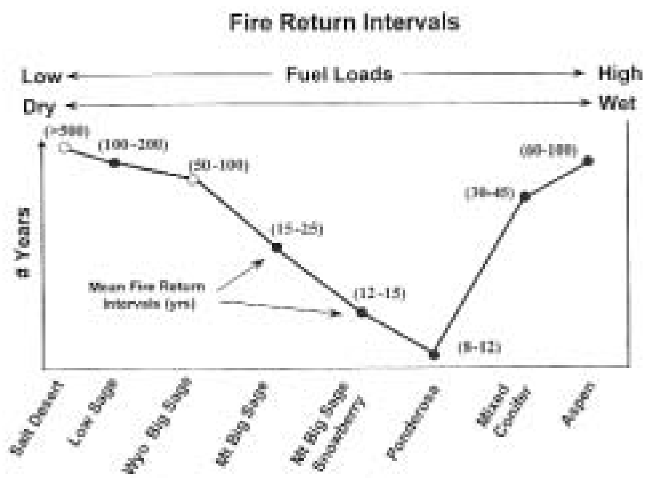
Western juniper is very susceptible to fire early in life when in grasslands, and at all life stages in brush fields. Mature juniper is fire resistant and the elimination of fine fuels further restricts fire spread. Fire frequently regulated the historic area occupied by juniper. The lack of fires in more recent times has resulted in many acres of overstocked juniper woodlands with little grass or brush in the understory. There has been an increasing amount of juniper invasion into former grasslands and shrub lands. When juniper trees invade wetter areas, such as meadows, their transpiration rates lead to a drier microclimate, which eventually leads to complete loss of the moisture-dependent community.

The most extensive fire history information in the semi-arid shrub steppe plant communities has been developed for the mountain big sagebrush – Idaho fescue (*Festuca idahoensis*) association. Pre-settlement Mean Fire Return Intervals (MFRI) ranged from 11 – 25 years and significantly increased (i.e. number of years between fire events increased) after the 1860s throughout much of this cover type. Two studies report fire-free periods varying between 8 and 29 years (Gruell 1999) and between 3 and 28 years (Miller and Rose 1999).

Mean Fire Return Intervals reported for the low sagebrush – Sandberg bluegrass (*Poa secunda*) cover type is considerably longer than adjacent mountain big sagebrush communities (Miller and Rose 1999). Fire free periods varied from 90 years (Young and Evans 1981) to 138 years (Miller and Rose 1999). A MFRI of 100 years should be adequate to create a low-density stand of widely scattered trees in low sagebrush – Sandberg bluegrass cover types.

Where western juniper is growing in association with ponderosa pine (*Pinus ponderosa*), the MFRI is similar to either ponderosa pine or mountain big sagebrush, depending on site-specific vegetation composition. Fire history studies in Oregon's ponderosa pine forests show a fire return interval of 3 to 50 years depending on site conditions and weather patterns (Agee 1993).

Figure 3-9. Estimated (open circles) and documented (closed circles) mean fire return intervals for major cover types in the Great Basin (Miller and Tausch 2001).



2. Management - Prescribed Fire vs. Mechanical Treatment

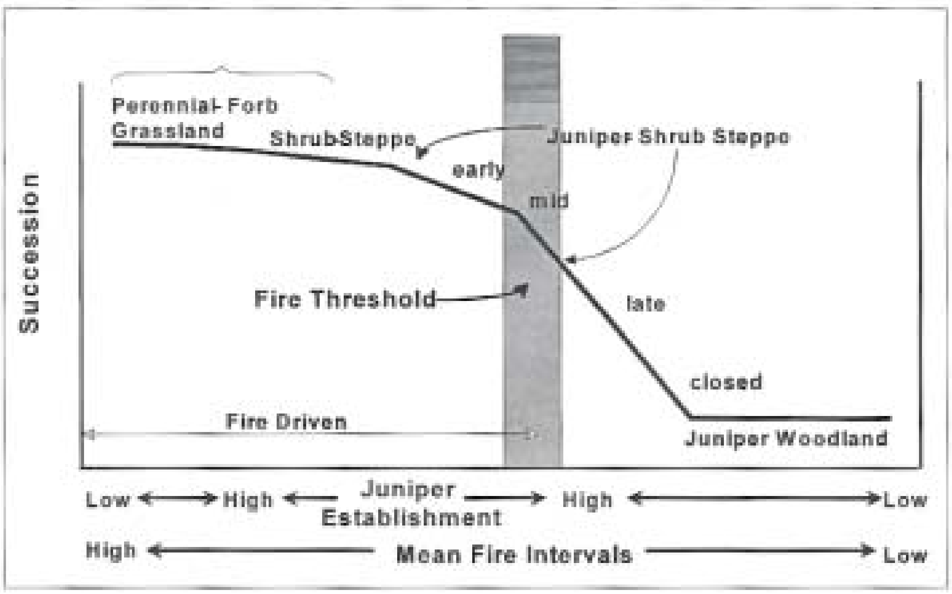
The condition of the shrub understory in juniper woodlands is critical in determining whether prescribed fire can be effective for fuels or vegetation management. As juniper canopy full potential cover increases toward 25 to 35 percent or greater (dependent upon soil conditions), the shrub layer collapses and the ladder fuels are eliminated. This occurs due to the trees out-competing the shrubs for available soil moisture. A model investigated by Miller (1984) estimates that under cool conditions (60 degrees & RH of 20%), 100 trees per acre of 12-inch diameter would use 200-250 gallons/day. When temperature is 90 degrees and relative humidity is 15 %, these same trees would use 450-500 gallons/day. Large numbers of trees tend to dry the site out, thereby fire proofing the site, by reducing ladder fuels.

The Figure 3-10 shows a conceptual threshold for the use of fire in juniper management for vegetation. Basically, the left side of the threshold bar is where prescribed fire may play a role. These communities are easy to burn and the understory vegetation recovers well in a couple of growing seasons. On the right side of the threshold bar, mechanical treatment would be more successful. The loss of significant understory vegetation could open the site up to invasion by annual vegetation or noxious weeds. Succession would have persisted in the early portion of this graph due to short fire return intervals. The fire threshold is crossed when understory fuels are no longer abundant enough to carry the fire.

Aspen

Quaking aspen stands are small and very scattered across the landscape. They are found in microsites with significant available water, as around springs or perched water tables. In some areas, black cottonwood may be found in aspen groves. Many aspen stands are declining due to invasion by conifers (juniper, pine, or others), livestock grazing of aspen suckers, and fire suppression. Periodic disturbance stimulates sprouting, and can create a mixed age and size structure. Disturbance by cutting or fire is necessary to stimulate regeneration of these declining stands, followed by exclusion of livestock and/or wildlife grazing. Aspen sprouts profusely after fire when grazing is properly managed in riparian areas. One problem is that current fuel loads in riparian areas are typically so heavy that fire severity may be well beyond pre-settlement levels and result in aspen mortality rather than stimulation of regeneration. (See Map 3.2 - Aspen Stands in the Gerber/Willow Valley Watershed Area).

Figure 3-10. Conceptual diagram of changes in a shrub steppe community in the absence of fire (from Miller et al 1999).



Non-Forested Uplands

Introduction

The following section breaks the analysis area into two discrete sections - BLM and Forest Service administered lands. The Forest Service lands are further broken down into the Fremont and Modoc National Forest areas. These breaks are made because all three bodies of information are different enough so that integration of the information is not possible at this time.

BLM Administered Lands - (The “Gerber Block”)

On the BLM administered lands within the Klamath Falls Resource Area (KFRA) portion of the analysis area, there are approximately 83,500 acres of non-forested vegetation. Non-forested, as defined here, includes juniper potential vegetation types. During the 1997 and 1998 field seasons, an Ecological Site Inventory (ESI) was completed for the Gerber Block, which classified all the BLM lands (and much of the intermingled private) into an array of ecologically distinct vegetation communities. Over 110,500 acres of vegetation were classified during the ESI, which in addition to the non-forested vegetation included an additional 27,000 acres within several ponderosa pine ecological types.

A major aspect of the ESI survey, in addition to an Order 3 soils survey, was a vegetation survey and mapping that compares the current vegetation against the potential vegetation by ecological site. A rangeland ecological site is, according to the *National Range and Pasture Handbook* (USDA 1997), *"...a distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation"*. The potential vegetation for a given ecological site is described in an ecological site description (which may also be referred to in this analysis as "site"). These site descriptions are prepared and maintained for various ecologically distinct regions or Major Land Resource Area (MLRA) by the Natural Resource Conservation Service (NRCS). For the Gerber Block the pertinent ecological site descriptions are for the D-21 MLRA, "*Klamath and Shasta Valleys and Basins*". During the 1997-98 ESI survey effort, the ecological site descriptions were revised and refined in a joint effort between the NRCS and the BLM. This resulted in site descriptions that are more Gerber specific, and hopefully more accurate, than the original descriptions.

The ESI vegetation information is based on an estimate of current years growth by plant species and results in an ecological condition, or "seral stage", rating. The more the current vegetation resembles the potential vegetation the higher the condition rating, and vice versa. The rating system is based on a scale of 0% to 100% similarity to the ecological site description. For example, if the plant community has nothing in common with the site description it would have a zero rating. Conversely, if the current vegetation is 3/4ths similar to the site description, the rating would be 75. The seral stages are classified into four different levels, as follows: 0-25% similarity is early seral (or "poor") condition, 26-50% is mid seral (or "fair") condition, 51-75% is late seral (or "good") condition, and 76-100% is the Potential Natural Community (PNC or "excellent" condition). Both types of terminology are used interchangeably in this analysis.

One general ecological concept should be kept in mind when considering the upland vegetation information in this watershed analysis. It relates to the primary condition determinate for most of the ecological sites in this area and is as follows: *The higher the proportion of perennial grasses present on a given site, the higher the seral stage and relative condition class.* Native perennial grasses, typically making up 40-70% of the community in the described PNC, dominated virtually all of the ecological sites in our area. The upland vegetation section of Step 4 will explain and explore this concept in more detail.

Overall, the ESI determined that conditions in the Gerber Block are proportionally as follows:

Condition Classes as % of total classified	
Potential Natural Community (PNC)	28.6%
Late Seral	53.7%
Mid Seral	17.1%
Early Seral	0.6%

Table 3-25 summarizes the acres of all classified vegetation by ecological site in the Gerber Block, including intermingled private lands. The allotment-specific tabulations are found in Step 5 - "Human Uses - Grazing" section. The following discussion should help to clarify the numbers in the table. The table includes data on a combination of approximately 87.8% public land and 12.2% intermingled private lands and represents the vast majority of the Gerber Block area.

The vegetation/condition figures summarized in the table were based on acreage figures calculated from the ecological site inventory (ESI) defined vegetation classification zones (site write-up areas) that have been entered into the BLM's Geographical Information System (GIS). It includes all vegetation-classified acres within allotment boundaries, including the private lands that were shown as intermingled with BLM in the GIS database and included in the ESI. Since the actual vegetation information from the ESI has not yet been entered into the GIS, the acres were tabulated by hand using the vegetation field sheets from the 1997-98 survey. Rounding and small calculation errors are thought to be less than 1%. This does not significantly detract from the larger picture that emerges from the data, i.e. acres by ecological site, stratified by condition class.

Table 3-25: Total Allotment Acres (Public & Private) by Ecological Site and Condition Class.

Ecological Site Name	**PNC**	**LATE**	**MID**	**EARLY**	**Total by ecological site**	
					Acres	%
Pine-Sedge-Fescue 16-24"	0	7,613	8,740	0	16,353	14.8
Pine-Mahogany-Fescue 16-20"	554	6,163	20	0	6,737	6.1
Juniper Dry Pine 14-16"	0	4,012	0	0	4,012	3.6
Juniper Claypan 16-20"	17,287	8,081	979	0	26,347	23.8
Juniper Claypan 12-16"	4,677	5,159	6,393	648	16,877	15.3
Juniper-Mahogany-Fescue 16-20"	0	300	56	0	356	0.3
Juniper Loamy Hills 10-14"	0	1,032	730	0	1,762	1.6
Mahogany Rockland 10-20"	0	173	0	0	173	0.2
North Slopes 14-18"	0	78	0	0	78	0.1
South Slopes 14-18"	104	86	799	0	989	0.9
Shrubby Loam 16-20"	0	768	74	0	842	0.8
Stony Claypan 14-20"	4,027	7,301	0	0	11,328	10.3
Claypan 14-20"	215	494	140	0	849	0.8
Claypan Bottom 12-18"	0	196	0	0	196	0.2
Shallow Stony 10-20"	2,196	17,001	791	0	19,988	18.1
Ephemeral Lakebed	1,900	169	0	0	2,069	1.8
Dry Meadow	67	597	162	39	865	0.8
Semi-Wet Meadow	28	0	0	0	28	<0.1
Irrigated Shallow Stony	0	16	0	0	16	<0.1
Irrigated Stony Claypan	551	108	0	0	659	0.6
Totals by condition class	31,606	59,347	18,884	687	110,524	100%

The total acres listed in the summary table above (110,000+ acres) understates the acreage within the Gerber Block, which the GIS tabulates to be approximately 128,000 acres. This latter figure is higher than the acreage generally acknowledged for the Gerber Block, which has been thought to be in the range of 110,000 to 115,000 acres. There are several reasons for this under tabulation. First, when defining the Gerber Block, the GIS database uses a different external boundary than used in past analyses (i.e. RMP) - particularly in the southeast corner of the area. This results in the inclusion of more privately owned lands within the area.

Second, the tabulated acres do not include water bodies or rock outcrops. There are numerous reservoirs in the Gerber Block, including Gerber Reservoir itself, which is over 3000 acres at the high water line. Related to the above is the GIS computation irregularity of calculating acres of land below reservoir high water lines as the same as the neighboring vegetation type. The high water mark on Gerber Reservoir (and some other reservoirs) is also the allotment boundary line for the neighboring allotments. The lands below the high water line (and below water much of the year) were not classified inside of an allotment boundary, but still calculated out as having the same vegetation as the neighboring ESI types. In fact, these areas are usually rock or mud flats.

Third, the tables do not include the unclassified (i.e. not vegetation mapped) private lands, which totals several thousand acres. Many of these private lands are either fenced separate and functionally discrete from the public lands, or were not mapped because it was the responsibility of another agency (i.e. Natural Resource Conservation Service) and was not completed. And finally, a large amount of the unaccounted for acres - both public and private - lie outside of the GIS defined allotment boundaries around the periphery of the Gerber Block and was not “captured” within a specified allotment when the database was queried.

Even though the ESI information for the Gerber Block has not been entirely compiled and input into all the appropriate data bases, the information covers at least 95% of the BLM lands in the area and has been analyzed enough to fully and proportionally describe the vegetation communities and their conditions in the Gerber Block.

The following is a summary of the current conditions, by ecological site, of the important vegetation communities in the Gerber Block. A brief overview of the Potential Natural Community (PNC) descriptions is found in *Step 4 - Reference Conditions: Non-Forested Uplands* later in this document and will be used as the baseline or "reference condition" for analysis purposes. However, since over 82% of the Gerber Block is in either late seral or PNC conditions, some Step 4 type information is unavoidable in this section. A comparison of the existing conditions (this section) with the potential (Step 4) will be done in *Step 5 - Synthesis and Interpretation*. (Note of clarification: Most ecological sites have the estimated precipitation range for that site listed after, and included as part of, the name, e.g. Stony Claypan 16-20". It is not the soil depth, as some believe.)

Meadow Communities (totals 2.7% of surveyed area)

These communities are found in areas where the effective moisture is higher than that found on the surrounding, more distinctly, upland sites. As a group, these sites make the smallest acreage within the analysis area, but are some of the most important due to various intrinsic resource values related to their inherent productivity and location. (*Note of explanation: The ESI did not specifically classify riparian/ wetland type areas, with the exception of the three sites that follow. Another survey was envisioned to classify the riparian areas to the degree befitting their importance. See the Riparian Section of this document for details*.)

<u>Dry Meadow (0.8% of surveyed area)</u> - This site is widespread throughout the Gerber Block, with a small presence in virtually every grazing allotment. Specifically, the ESI identified 865 acres of Dry Meadow. This site is dominated by silver sagebrush (*Artemisia cana* ssp. *bolanderi*) and Nevada bluegrass (*Poa nevadensis*), reflecting its seasonally saturated soils. Approximately 77% of the acres classified as Dry Meadow was rated as late seral or PNC. The remainder was primarily mid seral (19%), with a very small amount in early seral (4%). These sites have historically received above average grazing use by livestock due to herbaceous productivity, typical proximity to water, and lack of slope. Fortunately, due to the higher effective moisture on these sites, the opportunities for condition improvement (i.e. upward trends) are high with appropriate grazing management. Juniper does not generally invade this ecological site due to the seasonally saturated soils.

The Dry Meadow site is typically found as a transition between true riparian vegetation and drier upland areas, and as such, is often situated as a narrow band between those two categories of vegetation. Due to its transitional nature, this site is often hard to segregate and classify at the level of detail the ESI requires. That is, these areas are easy to see in the field, but hard to draw lines around due to their small size. During the ESI, this site was sometimes used as a "catch-all" site for quasi-meadow areas that did not neatly fit into another site description.

Late Seral/PNC areas are typified by at least 40% Nevada bluegrass, less than 25% silver sagebrush, and a minor mix of native forbs. Production can easily exceed 1000 lbs/acre. Bare ground is abundant on this site, even in good condition areas, and biotic crusts are apparently limited due to inundation, though this could be also due to these sites grazing attractiveness. Mid seral areas have lesser amounts of Nevada bluegrass (20-30%), greater amounts of silver sagebrush (30%-40%), and/or an increase in annual grasses and forbs. Production can be up to 1000 lbs/acre.

<u>Ephemeral Lakebed (1.8% of the surveyed area)</u> - This ecological site is also widespread in relatively small parcels throughout the Gerber Block, with a total of 2069 acres classified. (There is also a large amount of this type on the intermingled private lands that were not surveyed.) The Ephemeral Lakebed site occurs in

the small, closed basin "pothole" areas that are scattered throughout the Gerber Block. The site is also found in and around most of the artificial reservoirs, most of which were potholes with dikes built to enlarge them in the mid-20th century. This site is dominated by spikerush (*Eleocharis* spp.), which is a dense growing, rhizomatous, grass-like plant that thrives in areas that experience lengthy spring inundation. The Ephemeral Lakebed site is wetter than the Dry Meadow site, but has less moisture than is needed for a true Wet Meadow ecological site. The Ephemeral Lakebed community is also frequently mixed in with other riparian types along many of the drainages in the analysis area. Due to the saturated soils, juniper invasion is not possible within these sites unless the hydrology is drastically altered.

Virtually all (92%) of the Ephemeral Lakebed areas in the Gerber Block are classified as PNC, with the rest (8%) in late seral condition class. The ESI rated PNC areas typically are 70-90% spike-rush, with a minor mix of other rushes/sedges and a few species of forbs. Production at PNC usually is 1000-1500 lbs/acre. Biotic crusts are not common on this site due to the lengthy inundation period and churning, high clay soils. Late seral rated areas have less spike-rush (30-50%), more bare interspaces, and more other species of sedges/rushes. Late seral areas often have a significant component of mat muhly (*Muhlenbergia richardsoni*), which is a low growing, native rhizomatous grass that provides good ground cover.

All of the Ephemeral Lakebed areas have historically received higher than average grazing pressure for the same reasons listed for the Dry Meadow ecological site. Though coarse looking, spike-rush is a very palatable species during the spring to late summer period when green. It is also a very resilient species that is largely immune to relatively high levels of grazing pressure, as long as the lengthy seasonally saturated conditions persist and it is not grazed season long. Spike-rush is also extremely resistant to drought conditions, as were experienced during the late 1980's and early 1990's. These areas weathered that period with no apparent condition degradation, though livestock grazing largely continued unabated. Based on ESI observations, condition trends in this site have been found to be largely static reflecting the inherent resiliency and currently elevated ecological status.

<u>Semi-Wet Meadow (<0.1% of surveyed area)</u> **-** This ecological site is an extremely minor vegetation component of the Gerber Block, though very small parcels of it (<1 acre) can be found spread throughout. During the ESI, it was primarily noted as an undefined inclusion. This site is also seasonally saturated similar to the Dry Meadow site, but tends to be found as small inset pockets within larger upland areas. Its saturation is a function of runoff from these adjacent upland areas. This site is dominated by California oatgrass (*Danthonia californica*) which makes up 50-80%+ of the composition in late seral/PNC. The only classified site in the Gerber Block was rated as PNC. The analysis area also has abundant amounts of a similar species – single spike oatgrass (*D. unispicata*) - that is discussed more under the true upland sites.

(Note: There is also an ecological description for a Wet Meadow site, though it was not used during the ESI and will not be covered here. See the Riparian section.)

Shrub/Bunchgrass Communities (totals 31.4% of surveyed area)

a. Low Sagebrush Dominated Communities - Low sagebrush (*Artemisia arbuscula*) is by far the most abundant shrub species in the Gerber Block, reflecting the regnant shallow soils. Four ecological site descriptions cover all of the non-juniper, low sagebrush vegetation types, though the first two described below cover 97% of classified acres. The large majority of these sites were classified in good to excellent condition during the ESI.

Of interest, two forms of low sagebrush appear to exist in the area. Most abundant is the typical low growing form which is rarely more than 20" tall - sometimes well under 15"in height. The other form often grows up to 30+" tall and could possibly be a hybrid between low sagebrush and big sagebrush (*Artemisia tridentata* - two subspecies discussed later). This taller form is most often found in areas where both typical species coexist in proximity. Often this "big" low sagebrush is found on the slightly deeper soil transition zones between a true big sagebrush site and a neighboring low sagebrush type - but not always. Besides its height, big low sagebrush's primary characteristics are much more similar to typical low sagebrush than either big sagebrush species.

(Note: The "big" low sagebrush has many similarities to Wyoming big sagebrush (*A. t.* ssp. *wyomingensis*) - a subspecies of big sagebrush that is not thought to be in our area for two reasons: Wyoming big sagebrush likes moderate/deep, well drained, relatively loamy soils, whereas the "big" low sagebrush is found on moderately shallow, high clay soils; and Wyoming big sagebrush is found in areas with <12-14" precipitation, whereas areas where the "big" low sagebrush is found in Gerber are typically 16-20" precipitation - a significant moisture difference in sub-humid, sagebrush dominated, areas.)

<u>Shallow Stony 10-20" (18.1% of surveyed area)</u> - This is the most common of the non-juniper, sagebrush dominated ecological sites in the Gerber Block, with almost 20,000 acres classified. This community is dominated by Sandberg's bluegrass (*Poa sandbergii*) and low sagebrush, which is often of very low stature. Common sub-components of this site are single-spike oatgrass, which can form dense stands in low (i.e. wetter) spots within this site and rival the bluegrass for dominance, bottlebrush squirreltail (*Sitanion hystrix*), and Idaho fescue (*Festuca idahoensis*). The ESI classified over 96% of the Shallow Stony sites as late seral/ PNC, with the remaining 4% mid seral. Due to the thin soils (<12") this is the areas lowest production potential ecological site, averaging 250-300 lbs/acre of growth per year. Biotic crusts - especially mosses - are frequently very abundant within this site.

Late seral/PNC areas are typified by at least 50-60% native perennial grasses, less than 30% low sagebrush, and a mix of desirable native forbs species up to 10-15% composition. Production is usually in the 275-350 lbs/acre range, but is highly variable depending on soil depth and can be significantly more or less than that production range and still be in good or better condition. Biotic crust densities are as good as are seen in the analysis area. Mid seral communities typically have higher amounts of low sagebrush (>30%), greater amounts of weedy forb and annual grasses, and/or lesser amounts (<40%) of site typical perennial grasses. Mid seral sites are sometimes lower in production than late seral, but more often the production is similar but of less desirable plants (i.e. not/less site typical).

This ecological site is typified by the visually open, sometimes very rocky, "scabland" areas that are common throughout the Gerber Block. Juniper is very slow to encroach in to these sites due to the shallow soils, though many sites have some limited invasion occurring. Livestock grazing has probably been of above average intensity historically in these areas due to the gentle topography and generally easy accessibility. It is possible that some of the current Shallow Stony sites are ex-Stony Claypan sites, where the high levels of uncontrolled grazing in the late 1800's and early 1900's may have caused an extensive loss of the already shallow soils. Though impossible to conclusively prove, it is likely that an irreversible ecological site type change did occur to some of the Stony Claypan areas resulting in more Shallow Stony sites today. Which locations had this potentially happen is also not possible to evaluate. Regardless of past causes, soil formation is an extremely slow process in arid basaltic areas, and these areas will remain as and be managed as Shallow Stony sites. Condition trends in this ecological site throughout the Gerber Block are static to upwards based on trend monitoring studies and ESI observations.

<u>Stony Claypan 14-20" (10.3% of surveyed area)</u> - The Stony Claypan ecological site is also common throughout the Gerber Block, with over 11,300 acres classified. This site is, however, more common in the higher (above 4800') northern and eastern portions of the area, where there is somewhat more available moisture. This vegetation community is typically dominated by Idaho fescue and low sagebrush, with significant sub-components of single-spike oatgrass (denser in "swale" areas), bottlebrush squirreltail, and Sandberg's bluegrass. The ESI classified 64% of this site as late seral and 36% as PNC. Average yearly

production ranges from 500-750 lbs/acre, depending on site specific rockiness and soil depth, and over 1000 lbs/acre in some ideal areas.

PNC areas typically have vegetative compositions with better than 60% native perennial grasses, less than 20% low sagebrush, and a mix of desirable native forb species in the 5-10% range. The late seral areas are similar to PNC but typically have 25-35% low sagebrush and 40-50+% site typical perennial grasses. Both condition classes have moderate amounts of biotic crusts and similarly good stability and functionality. Even though none was classified within the Gerber Block, mid seral conditions would have higher amounts of low sage (35%+), less perennial grasses (<35%), and/or more weedy forbs and annual grasses as compared to the late seral areas.

This site is almost identical vegetatively to the Juniper Claypan 16-20" ecological site (discussed later), except that it does not have old juniper trees (i.e.150+ years old). This is probably due to the Juniper Claypan sites being generally rockier and less conducive to wildfires than the Stony Claypan, though this site is not thought to have a high fire frequency either. Both sites often lie adjacent to each other. The Stony Claypan site has probably experienced widely varying amounts of historical livestock use, depending primarily on the rockiness of the specific area. Inevitably, these areas have received higher than average grazing use levels due to the intrinsic quantity and quality of the forage species. This site has moderate potential for juniper encroachment which is occurring in some areas. However, due to the similarity between the Juniper Claypan and Stony Claypan sites, it is difficult to differentiate an invaded Stony Claypan site from a Juniper Claypan with younger trees (due to past fire removal of the older growth junipers). Condition trends in the Stony Claypan sites throughout the Gerber Block are static to upwards based on various trend monitoring studies and ESI observations.

<u>Claypan 14-20" & Claypan Bottom 12-18" (1.0% of surveyed area)</u> - Both of these ecological sites are found infrequently in the Gerber Block and are similar enough to be considered together as they occupy similar locations on the landscape. Both are also distinct enough from the Stony Claypan to be considered separate sites, in that they both are generally free of rocks - surface or subsurface. Both the Claypan and Claypan Bottom sites are typically located near the edges of drainages or other slightly wetter areas that are not moist enough to support a Dry Meadow community. Both sites are dominated by Idaho fescue and low sagebrush, but the Claypan Bottom has a significant (up to 15%) component of Nevada bluegrass, whereas the Claypan will not. (Visually, the Claypan Bottom looks like the Dry Meadow site with the silver sagebrush replaced by low sagebrush.) Both sites have moderately high production potential of 600-900 lbs/acre in elevated condition classes. The ESI classified most (87%) of these two sites as late seral/PNC with the remainder (13%) mid seral (all the mid seral was Claypan).

Late seral/PNC areas typically have 50-60%+ site appropriate native perennial grasses, less than 30% low sagebrush, a minimum amount of weedy forbs and annual grasses, and production above 500 lbs/acre. The mid seral areas have limited production (<500 lbs/acre), higher levels (30%+) of low sagebrush, limited (<35%) perennial grasses, and/or a significant amount (20%+) of annual forbs/grasses. Historical grazing use in these sites was probably high due to ease of access and high productivity. Juniper encroachment is a minor (Claypan bottom) to moderate (Claypan) concern in these sites. Some juniper increases were noted during the ESI, but it is not considered a significant issue because of the limited area of both sites. Condition trends in these sites appear to be largely static based on ESI observations.

b. Big Sagebrush/Bitterbrush Dominated Communities (totals 2% of surveyed area) - Two subspecies of big sagebrush are found within the Gerber Block - mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and basin big sagebrush (*A. t.* ssp. *tridentata*). Mountain big sagebrush is the most common by far and the only subspecies that is typically present in the sites described below. Even though mountain big sagebrush is commonly found throughout the area, it is rarely abundant enough to define an ecological site and primarily exists as a minor component of other ecological sites with deeper soils -

particularly the pine sites. Antelope bitterbrush (*Purshia tridentata*) is similar to mountain big sagebrush in that it is common throughout the analysis area, but rarely in enough density to define a site. Bitterbrush is present in virtually all of the non-riparian/wetland ecological sites in the analysis area, often as a sub-dominant (5-10% or more), but usually as a minor component (<5%).

<u>Shrubby Loam 16-20" (0.8% of surveyed area)</u> - This ecological site was newly described for the Gerber ESI and is found sporadically through the center and northern portions of the Gerber Block. It is co-dominated by mountain big sagebrush and bitterbrush, with a significant understory of Idaho fescue, Sandberg's bluegrass, and other perennial grasses. It is often, but not always, found as a narrow transition area between the pine and low sagebrush sites where the soils are of moderate depth. The ESI classified most (91%) of this site as late seral, with the remainder (9%) as mid seral. Due to the deeper soils on this site, production potential is relatively high and can reach or exceed 1000 lbs/acre.

Late seral/PNC areas are typified by 35-50%+ native perennial grasses, 20-30% big sagebrush and bitterbrush, and a significant (5-10%) mix of site typical native forbs. Biotic crusts are of low to moderate density and production is in the 700-1000 lbs/acre range. Mid seral communities have somewhat less perennial grasses, more shrub and juniper density, and/or weedy forbs and annual grasses are more abundant (10%+). Encroachment of juniper, crowding out the site typical grasses and, in particular, shrubs, is a major concern on these sites. Historically, these areas have received higher than average grazing use levels due to easy access and the intrinsic quantity/quality of the forage species. Based on ESI observations, condition trends in these sites appear to be largely static, though where juniper is a significant invader, conditions would be considered as slowly trending downwards. There are also a few sites - most notably east of Gerber Reservoir - that have juniper invasion in high enough density to almost totally out-compete the shrubs and most of the grasses.

<u>South Slopes 14-18" (0.9% of surveyed area)</u> - The South Slopes ecological site is found in the central and southern portions of the Gerber Block. At PNC, this site is typically dominated (40-60%) by bluebunch wheatgrass (*Pseudoroegneria spicata*, a.k.a. *Agropyron spicata*) with significant amounts (10%+) of Idaho fescue and a shrub overstory (20-30%) of mountain big sagebrush and/or bitterbrush. During the ESI, most (81%) of the South Slope sites were determined to be in mid seral condition, with smaller amounts in late seral (9%) and PNC (10%). Annual production is wide ranging with the potential for 800-1000 lbs/acre at PNC, though it is usually less in the Gerber Block due to juniper invasion and historic condition impacts. Biotic crusts are typically in the low moderate range.

The mid-seral condition sites in the Gerber Block have a relatively high (20-40%) canopy cover of invasive juniper, relatively low production (400-675 lbs/acre) which, at least partially, reflects the juniper competition, and a herbaceous understory that has a relatively high percentage (10-20%) of weedy species like cheatgrass (*Bromus tectorum*), willow herb (*Epilobium* spp.), medusaehead (*Taeniatherum caput-medusae*), and others. (See the Non-Forested Upland section in Step 5 for a discussion on the mid-seral condition sites.)

<u>North Slopes 14-18" (0.1% of surveyed area)</u> - This is the only ESI defined bitterbrush dominant site, though the Shrubby Loam site has it as a co-dominant. This site's aspect is dominated by bitterbrush - with some mountain big sagebrush - and it has an understory dominated by Idaho fescue and other perennial grasses. The North Slope ecological site was only classified in one location in the Willow Valley allotment below Willow Valley Reservoir. It was found to be in late seral condition and estimated to be have an upward trend. (Since it is an extremely minor acreage, it will not be discussed further.)

c. Mahogany Communities- Mountain mahogany (primarily curlleaf - *Cercocarpus ledifolius*, though there is some birchleaf - *C. betuloides*) is a common, though rarely a distinctly dominant species within the Gerber Block. It is commonly found in most of the juniper and pine ecological sites, with a particular affinity for the deeper soil, mixed tree areas (i.e. pine and juniper together). Specifically, mountain mahogany is a common sub-dominant species in the Juniper Dry-Pine 14-16", Juniper-Mahogany-Fescue 16-20", and to some degree, the Pine-Sedge-Fescue 16-24" ecological sites, which will be discussed later.

One ecological site is defined by mountain mahogany - the Mahogany Rockland 10-20" site (0.2% of the surveyed area). This is a highly variable site depending on landscape position, topography, slope, aspect, rockiness, and probably other factors. In late seral/PNC condition, this site is typically co-dominated by mahogany and/or bitterbrush, with a wide array of other shrub species present, including mountain big sagebrush, chokecherry and Klamath plum (*Prunus* spp.), snowberry (*Symphoricarpos albus*), serviceberry (*Amelanchier alnifolia*), gooseberry/currant (*Ribes* spp.), and numerous other species in lesser quantities. Grasses are typical for the area, though dominated by Idaho fescue, various bluegrasses and needlegrasses (*Stipa* spp.), and many other species potentially present. During the ESI, this ecological site was found throughout the analysis area, though usually as an unmeasured inclusion in the pine and/or juniper dominated areas. The two ESI identified "pure" Mahogany Rockland areas are on Horse Camp Rim and in the Miller Creek Canyon. Both sites had production in the 900-1000+ lbs/acre range and were rated as late seral. Both areas also had moderate to high levels of biotic crusts. Livestock grazing in these areas has probably been a negligible condition factor due to natural topographical exclusion precluding most use. Fire exclusion has been more of a factor in allowing juniper encroachment to reach site atypical levels.

One further observation, pertinent to mountain mahogany in the analysis area, needs to be discussed. That is the widespread "collapse" of mountain mahogany as a major sub-component in the major pine/juniper sites noted above. In particular, the Pine-Mahogany-Fescue and Juniper Dry Pine sites have experienced major reductions in the quantity of mahogany in the understory. Residual dead mahogany stems and trunks often litter the ground in these ecological sites, and of significant future concern, many of these die-off areas are not experiencing sufficient regeneration of new mahogany plants to adequately replace the dead plants. This die-off appears to be due to the increase of juniper in these sites, which is possibly related to both fire exclusion and livestock grazing, though the actual causes are probably more complicated. In addition, the more pine dominated, Pine-Sedge-Fescue 16-24" ecological sites, have experienced some mahogany diebacks, but not to the extent of the Pine-Mahogany-Fescue sites.

Juniper Communities (totals 44.6% of surveyed area)

True western juniper (*Juniperus occidentalis*) potential vegetation communities make up the largest single class of ecological sites within the BLM managed portions of the analysis area, with approximately 50,000 acres classified within the 5 juniper potential ecological sites. Juniper and juniper sites are found throughout all portions of the area with most (88%) of the ESI classified juniper acreage falling into the first two Juniper Claypan ecological sites described below.

Unlike most juniper areas in the Intermountain West, where only 3 to 5% of the juniper is old-growth (Miller, et.al. 1999), almost all of the juniper areas in the Gerber Block are true old growth potential ecological sites with an average range of 8-15 "old" juniper trees per acre at PNC. (The ESI defined an old juniper as being at least 150 years old and an old growth juniper site as averaging - or having the potential for - at least 5 old juniper trees per acre. See the previously referenced publication for a general overview of the primary characteristics that allow for reasonably accurate age estimations of old junipers. Also, see the KFRA internet site for a narrative and pictorial summary of the Gerber juniper areas.)

The Gerber Block juniper areas are presently a mix of savanna and woodland types. The savanna type is the classic old juniper site where the trees are widely spaced (<10-15% canopy cover) and the tree interspaces are primarily influenced by shrubs and herbs with little influence from juniper roots. The Gerber juniper woodland sites have higher - sometimes much higher - canopy cover and tree density, with the juniper root competition in the tree interspaces being moderately dominant to co-dominant with the shrubs grasses. Woodland sites are generally savanna sites with significant 20th century juniper density increases; these are not accurately called invasion since these are true juniper sites. Overall, the savanna types condition rated PNC or within the upper half of the late seral range. Woodland areas varied, but were generally condition rated in the lower half of the late seral range or mid-seral. Specifics by different ecological site can be found in the following:

<u>Juniper Claypan 12-16" (15.3% of surveyed area)</u> - This ecological site is the dominant “old growth” juniper site in the southwestern and south central portions of the Gerber Block. In this area, this site ranges from about 4200' to an upper elevational limit of about 4700-4800' and receives precipitation in the 13-15" range. Compared to the Juniper Claypan 16-20" areas, this lower precipitation enhances conditions for bluebunch wheatgrass which becomes co-dominant with Idaho fescue in the described PNC. Scattered old juniper trees with an understory of low sagebrush, widely scattered bitterbrush, and the two previously noted perennial grasses dominate the visual aspect of this ecological site. This site has the widest range of current ecological conditions of any of the major vegetation sites, with 27% in PNC, 31% in late seral, 38% in mid seral, and 4% in early seral. In fact, this ecological site accounted for almost all (94%) of the classified early seral vegetation and 63% of the non-pine mid seral vegetation, for reasons explained below.

Late seral/PNC areas, as classified by the ESI, are typified by 40-60+% native perennial grasses - particularly Idaho fescue, bluebunch wheatgrass, Sandberg’s bluegrass, and single-spike oatgrass, in descending order of importance. Low sagebrush is usually <20%, site typical forbs range from 5-15% with a minimum of weedy species, and annual production typically ranges from 500-900 lbs/acre, though it can be lower (250-500 lbs/acre) and still condition rate compositionally as late seral. These latter, low production/high seral state communities are thought to actually be a strong indicator of the vegetative condition improvements made since pre-Taylor Grazing Act (1934) grazing abuses that caused a significant and irrevocable loss of the already shallow soils. The natural vegetation composition has and continues to be properly re-establishing, but the higher productivity potential is essentially lost with the soil. Similarly, all of the early seral areas actually classified as mid seral plant composition, but were downgraded due to low production.

Related to the above information, is the ESI observation that some of these Juniper Claypan sites are functionally very similar to a Shallow Stony 10-20" ecological site, except the soil is just deep enough to support some old junipers, but not deep enough to be dominated by Idaho fescue and/or bluebunch wheatgrass. The dominant grass in these areas is Sandberg’s bluegrass, which would dominate a Shallow Stony site in good condition. During the ESI survey efforts, thought was given to splitting out another ecological site that would be a “Juniper Shallow Stony”. This was not done, however, in the belief that these sites are probably Juniper Claypan sites that were permanently impaired by the early grazing pressures, and as such, are not a true ecological site. (Note: since the Gerber ESI, there has been work done in describing this site by personnel at Oregon State University - Eastern Oregon Agricultural Research Center, Burns, OR. See Miller, et.al. 1999, for more information.)

The mid and early seral Juniper Claypan 12-16" communities are found largely within the 1937 wildfire area which burned a substantial area (10,000+ acres) spread over portions of the Willow Valley, Bumpheads, Horse Camp Rim, and Horsefly allotments (Beckham 1999). These lower seral areas are typified by the limited and sporadic presence of old junipers, the fire having destroyed the majority. In addition, these areas are less dominated by native perennial grasses (<40%), higher levels (20-30%) of low sagebrush, site atypically high densities of post-fire aged juniper, and/or have high amounts (20%+) of annual forbs and grasses - exotic and native. The south Gerber Block is known to have received some of the highest grazing pressure in the area (i.e. Woolen Canyon was named as such due to it being a favored place for sheep grazing by itinerant herds). Since the Taylor Grazing Act (TGA) controls were just being implemented on the ground in 1937, these areas were almost assuredly still being highly over grazed and in poor condition from decades of abusive grazing pressure. After the 1937 fire, these areas were probably not rested from grazing use, which continued - albeit at lesser levels than pre-TGA. These pressures, in combination, led to impacts to the soil and vegetation resource that were extreme enough so as to permanently compromise site productivity and potential.

Juniper Claypan 16-20" (23.8% of surveyed area) - This ecological site is the dominant “old growth” juniper site in the higher elevation (>4700') northern and eastern portions of the Gerber Block. This site is the most abundant ecological site in Gerber; making up almost one quarter of the ESI classified acreage. It is typically dominated by Idaho fescue and low sagebrush with the overall aspect visually dominated by scattered juniper trees - mostly old growth at PNC. This site has some of the most elevated ecological conditions of any in the Gerber Block, with 66% in PNC, 30% in late seral, and 4% in mid seral. Overall, this ecological site accounts for 55% of all the classified PNC acres.

The highest seral areas (PNC) are dominated (50-65+%) by perennial grasses with the majority being Idaho fescue, but with Sandberg’s bluegrass and single-spike oatgrass being significant sub-dominants. Low sagebrush tends to be less than 25% composition and site typical forbs are in the 5-10% range. Old juniper trees are abundant (5-10+ per acre) with limited regeneration of younger trees (<100 year old trees) in between. Late seral sites are similar except for a slight diminishing of the native perennial grasses (40-50% in total) and an increase in low sagebrush (25-35%). Forbs species and abundance is similar to PNC, but young junipers are more abundant in these areas as compared to PNC. Overall annual production is in the 600-800 lbs/acre range for both these condition class areas with moderate to moderately high density biotic crusts. Mid seral areas take the PNC to late seral vegetative trends and amplify them further with lesser quantities (<40%) of the desirable perennial grasses, low sagebrush in the same range, and more numbers of invasive juniper in the interspaces between the old trees. In addition, the mid-seral areas have increased quantities (15-20%+) of weedy forbs and annual grasses, and overall production is usually greater than 500 lbs/acre.

Similar to the previously described Juniper Claypan 12-16" site, a few of the Juniper Claypan 16-20" PNC and late seral sites were downgraded a condition class due to low production. In fact, all of the ESI classified mid seral areas had late seral plant diversity, but were production suppressed. The same rationales noted previously about past soil loss and ecological site damage holds for these downgraded sites also.

Juniper Loamy Hills 10-14" (1.6% of surveyed area) - This ecological site is found only in the extreme southwest corner of the Gerber Block and entirely within the Willow Valley Chaining pasture of the Willow Valley Allotment. It is the vegetation type that was chained and seeded in 1967-68, in partnership with the Oregon Game Commission, to create more deer (and livestock) forage in an otherwise ecologically degraded area; a function that the area still performs today. The area is of two distinct vegetation types - the relatively good forage condition chained and wheatgrass (*Agropyron* spp.) seeded areas and the lesser condition, untreated areas. These two plant communities will be addressed separately. (Note: The revised draft ecological site description lists mountain big sagebrush as the defining shrub species. However, field observations indicate that this area is a mix of mountain, low, and the previously described, “big” low sagebrushes, with the latter variant most abundant.)

The chained/seeded area (59% of this site) is in “good” condition for a seeding. A good condition seeding is the functional equivalent to late seral for native communities, except it is based on percent (in this case 50-75%) of the desired forage species. An ecological site rating is of little meaning in a seeded area, since it has been purposely altered for forage production reasons. The primary objective for the Chaining today continues to be to provide forage for both the migratory deer herd and livestock grazing. Annual production in the chaining is around 1000 lbs/acre and average for this ecological site. (See Step 5 for more discussion.)

In the non-chained native areas (41% of this site), conditions were rated as mid seral. The actual numerical ratings were in the lower end of the late seral condition class, with the ultimate rating downgraded to mid seral due to low production, i.e. 250-450 lbs/acre on a site that should be in the 1000 lbs/acre range. This lessened production is a function of the often noted heavy livestock grazing in the early days that created stressed ecological conditions that led to soil loss allowing weedy annual forbs, grasses, and invasive juniper to dominate the site. Fortunately, these type areas are a very small percentage of the Gerber Block.

<u>Juniper-Mahogany-Fescue 16-20" (0.3% of surveyed area)</u> - This ecological site was newly described for the Gerber ESI in 1998. It is similar to the next described site except that pine is absent. Both sites have juniper trees with tall, straight growth forms reminiscent of a similar stand of pine. This site occurs infrequently - as indicated by the small acreage - and is either a transition type between a Juniper Claypan and adjacent pine dominated site or found along the base of the low, basalt escarpment rims common in the Gerber Block. It is the slightly deeper soils (deeper than low sagebrush areas and shallower than typical pine) in these areas that support the Juniper-Mahogany-Fescue sites. Most of this site was ESI rated as late seral condition (84%) with the rest (16%) mid seral. Since it is rare and, in fact, is probably a pine free derivative of the following site, this site will not be discussed further; the following discussion will suffice.

<u>Juniper-Dry Pine 14-16" (3.6% of surveyed area)</u> - This ecological site is the driest of the sites with a ponderosa pine component and occurs in the southeast and south central portions of the Gerber Block, ranging from 4800' to 5100' elevation. The aspect of this site is co-dominated by juniper and pine, with a typical mid-story of juniper and pine reproduction, and understory of various shrubs and grasses. Annual production can be up to 1000 lbs/acre, but is usually less due to the shading/competition effect of the tree overstory and, most significantly to recent aggressive prescribed fire activities in most of these sites (discussed later in Pine Communities). The Juniper Dry-Pine ecological site is one of the sites experiencing an extensive die-off of mountain mahogany in the understory, as noted in the section on Mahogany Communities.

All of the Juniper Dry-Pine sites (4000+ acres) were ESI classified as late seral condition. Late seral (and PNC) is typified by a relatively high (40-50%+) canopy cover of pine and juniper and 50+% highly diverse and variable mix of native perennial grasses or grasslike species - in particular bluebunch wheatgrass, Sandberg's bluegrass, Ross's sedge (*Carex rossi*), Idaho fescue, several species of needlegrass, and bottlebrush squirreltail. The shrub layer can be equally diverse in species, though it is usually dominated by mountain mahogany and bitterbrush, with frequent significant amounts of mountain big sagebrush, currant, serviceberry, chokecherry/Klamath plum, and occasionally squaw carpet (*Ceanothus prostratus*). Forbs are not abundant in this ecological site and are usually less than 5% of the composition. Late seral differs from the estimated PNC primarily by having lessened production (usually due to recent under burning), the previously noted reduction in mountain mahogany composition, a small but significant component of annual grasses/forbs, and higher levels of young juniper, bottlebrush squirreltail, and/or rabbitbrush.

Pine Communities (totals 20.9% of surveyed area)

The two primary pine dominated sites are the Pine-Mahogany-Fescue 16-20" and Pine-Sedge-Fescue 16-24" ecological sites. Pine areas are more comprehensively addressed in the Forested Uplands section and will only be addressed here from the perspective of the Ecological Site Inventory data. Both sites are found in the same general elevational range (4800-5400'), where they occupy the deeper soil upland areas. Both sites have wide variations in plant composition and density. (Note: The ESI is not particularly meaningful in areas dominated by moderate to dense stands of coniferous trees, primarily because so much of the standing biomass and yearly production goes into the trees, where it is not accounted for by the survey methods. This is because the ESI only records annual plant production up to 4 ½' above the ground; a reflection of this survey's lineage to earlier rangeland survey methods. There are separate, more appropriate, survey methods used in timbered areas referenced in the Forested Uplands section.)

<u>Pine-Mahogany-Fescue 16-20" (6.1% of surveyed area)</u> - This ecological site is a distinct transition between the true pine and old juniper potential areas. It is functionally a slightly higher and moister equivalent to the Juniper Dry-Pine site above and is found in the northern and eastern Gerber Block. The ESI rated most

(92%) of these sites as late seral, with 8% PNC and <1% mid seral. The late seral areas range widely in annual production from 450-1000 lbs/year. Production is commonly suppressed by thick pine needle duff or repeated underburning. Generally, the more recent the burning the lower the production.

Late seral communities have widely varying plant communities, but generally have 40-60% perennial grasses - primarily Ross's sedge, Idaho fescue, various bluegrasses (*Poa* spp.) and needlegrasses, bottlebrush squirreltail, and occasionally bluebunch wheatgrass. There are usually small percentages (5-8%) of annual grasses - both exotic and native species. Forbs are a minor component of this site, generally comprising 5% or less of the composition. Shrubs are widely variable in amounts (20-40% of composition), but are similar to the species found on the previously described Juniper Dry-Pine sites, with the addition of snowberry, manzanita (*Arctostaphylos patula*), and snowbrush (*Ceanothus velutinus*). In the late seral condition class, younger juniper is often an increasing component and the mahogany has often significantly decreased - not coincidentally, as noted in the Mahogany Communities section. The PNC sites are very similar to late seral, but have grass compositions on the upper end of the range (60%), few annuals, a variety of shrubs totaling about 30% composition, a still significant mahogany component, and limited increases in young juniper.

<u>Pine-Sedge-Fescue 16-24" (14.8% of surveyed area)</u> - The Pine-Sedge-Fescue ecological site is the most pine-dominated site found within the Gerber Block. It occupies the deepest non-riparian soils and is one of the more abundant ecological sites. The ESI rated these sites almost equally between late seral (47%) and mid seral (53%). However, virtually all of the mid seral areas actually ranked out as late seral, but downgraded due to production. Annual production on this site should average around 800 lbs/acre, but due to their recently disturbed nature (under burned), production was usually about half of that on the mid seral areas. The plant composition of both seral stages is similar and widely variable. Native perennial grasses range from 30-65%, site typical shrubs - 20-50%, tree reproduction is usually <15%, with forbs being a minor component (<10%). Difference in production is the primary determining factor between late and mid seral ratings.

As noted, both pine dominant sites have been the primary beneficiary of the recent, comprehensive KFRA underburning program. The primary ecological impact of this extensive prescribed burning has been a significant diminishment of the understory in a majority of these sites - particularly the non-resprouting shrubs - which appear to take 10-20+ years to significantly re-establish. In addition, most all of these sites have had some amount of timber harvest, which has often caused a decrease in the condition class by reducing the understory as a side-effect of the timber harvest methods and subsequent, post harvest, reclamation activities.

Many of the pine stands have had both activities - timber harvest and underburning - occur and is the primary cause of the large percentage of the Pine-Sedge-Fescue sites being in the mid seral condition class. Unlike the juniper and sagebrush/bunchgrass areas, historic livestock grazing appears to have been a limited factor in the condition of these sites. Utilization pattern mapping generally shows little use of the pine sites by cattle. The majority of the areas classified in the two pine sites were estimated, during the ESI, to have upward trends, largely as a result of the recent post-disturbance (underburning and timber harvest) increases in shrubs and grasses.

FS Administered Lands

<u>Fremont National Forest</u>
On the NFS administered lands surrounding the Gerber block there are approximately 42,831 acres of non-forested vegetation within the watershed boundary. This type of vegetation consists primarily of juniper/low sagebrush and low sagebrush/fescue-squirreltail communities. (Refer to Table 3-26.)

Table 3-26: Acres of non-forest vegetative communities surrounding the Gerber Block.

ECOLOGICAL CLASSIFICATION	ACRES
Juniper/Low Sagebrush/fescue (Juniper Claypan 16-20")	15,459
Low Sagebrush/Fescue-Squirreltail (Stony Claypan 14-20")	24,757
Big Sagebrush/Bunchgrass (Shrubby Loam 16-20")	14
Sagebrush (Shrubby Loam 16-20")	17
Meadow (wet, moist, dry) (A mix of all BLM meadow sites)	1,517
Water	572
Rock	28
Aspen (See Forested Upland section)	11
Grasslands (unknown equivalent)	38
Alpine Low Sagebrush/Red Fescue (No BLM equivalent)	3
Unknown	415
TOTAL	42,831

These figures reflect just the NFS acres lying within the Gerber/Willow Valley watershed boundary. (Note: Most of the Forest Service vegetation/ecological types in the chart above have direct counterparts with some of the ecological site descriptions discussed in the BLM section that follows. The BLM descriptions and information should be a reasonably accurate representation of the Forest Service types also. In the above table, the name in parenthesis following the vegetation types is the BLM ecological site thought to be equivalent to the NFS type.)

There are eleven NFS allotments within the watershed boundary. Seven are on the Bly ranger district and 4 on the Lakeview ranger district. Ecological classification and acres are shown by allotment in Table 3-27.

Table 3-27: Ecological Classification and Acres by Allotment for Bly and Lakeview Ranger Districts.

Allotment Name	Juniper/ Low Sage /Fescue	Low Sage /Fescue /Squirrel -tail	Meadow	Water	Rock	Un-known	Big Sage /Bunch -grass	Grass -lands	Alpine low sage /Red Fescue	Sagebrush
Arkansas	2,766	927	93	28	28	81				
Barnes Valley	2,542	2,266	87	46		35				
Bly Ridge	2									
Horse Fly	1,458	1,900	98			26				
Privy Spring	270	125								
Pitchlog	465	1,430	119	55		23				
Yainax	1,097	6,605	557	9		118	14			
Bear Valley	1,704	3,621	15	185		7		35	3	
Dent Creek	3									
Fort Springs	434	427	17							17
Wildhorse	500	762	94	104		16				

Modoc National Forest

These lands are located in California, immediately south of the BLM administered lands and comprise a small portion of the analysis area. The following information was provided by Brad Reed, Resource Officer, Doublehead Ranger District, Modoc National Forest, and inserted with minor format changes. The information is for both allotments (Warm Springs and Clear Lake) that lie partially within the watershed analysis area. However, the vegetation information is not computerized so the acres by allotment/pasture cannot be broken out at this time. The vegetation types are relatively uniformly spread over the allotments so that the acres may not be correct, but the proportions are roughly the same. See Map 3.3 (Appendix E) for locations of vegetation types.

Warm Springs Allotment

The following range types were determined for the Warm Springs allotment during range analysis in 1979. This is the most recent typing done on the Warm Springs allotment. Types are standard Forest Service range typing done according to Region 5 standards that were in place in 1979.

Only a portion of the Warm Springs allotment is within the Lost River watershed. No attempt has been made to determine acreage by type that is inside the watershed boundary. Type distribution is fairly uniform within the allotment, however, so a rough determination of vegetation types within the watershed may be determined by the distribution of type occurrence on the allotment as a whole.

Table 3-28: Lost River Watershed Vegetation Types within the Warm Springs Allotment Doublehead Ranger District - Modoc National Forest.

Type Designator	Type Name	Acres
1	Perennial Grassland	689
2	Meadow	320
4	Sagebrush	2,383
5	Mountain Shrub	92
6	Coniferous Forest	4,167
9	Juniper	6,312

In 1992 and 1993, upland vegetation was evaluated for the Clear Lake allotment in support of detailed environmental analysis and allotment management planning. The Clear Lake allotment includes a portion of the Lost River watershed. For ease of comparison, ecological types have been aggregated into 4 broad vegetative types. These are 1) pine-juniper woodlands, 2) juniper/sagebrush savannas, 3) sagebrush, and 4) medusa head grasslands.

1. Pine-Juniper Woodlands

Occur on 1735 acres in the northeastern portion of the Clear Lake allotment, primarily on fault ridges and colluvial slopes; they cover approximately 5% of the allotment (Ecological Types 3, 4, 9, 15, 21 and 26A). These areas are covered by dense juniper (*Juniperus occidentalis*) with scattered Ponderosa pine (*Pinus ponderosa*). The Canopy cover of juniper ranges from 20% to 40%, with most between 20% and 30%. Pine cover is generally less than 3%, except in occasional small clumps. Understory shrub communities range from Wyoming big sagebrush (*Artemisia tridentate var. wyomingensis*) and rubber rabbitbrush (*Chrysothamnus nauseosus*) on low relief areas to mountain mahogany (*Cercocarpus ledifolius*), gooseberry (*Ribes spp.*), and wild cherry (*Prunus spp.*) on steeper terrain. Grasses are primarily Idaho fescue (*Festuca idahoensis*), and bluebunch wheatgrass (*Agropyron spicatum*).

The current plant community is late seral. A trend toward progressively less pine in the mix may be in progress as a result of fire suppression. Most pine individuals are mature, while juniper occurs in all age groups. In some areas, entire stands of mountain mahogany are dead or decadent. The ecological status of the pine-juniper types is satisfactory. There is little or no evidence of accelerated soil erosion. The amount of bare soil is low due to high litter cover. Shrub and herbaceous diversity is adequate; future management needs to be directed toward preserving this. Weedy annual grasses and forbs are an insignificant component of the herbaceous layer.

Forage production is widely variable. Actual measurements were not made on most of these areas. Where tree cover is dense, grass and shrub production is rather low; ocular estimates are in the 100-200 lbs/acre range. As tree cover decreases, forage production increases. In these more open areas, shrubs exert the same suppressive affect on grasses as the trees did. When shrub production is high, grass production is low. When shrub density decreases, grass production goes up. The highest amount of grass forage production observed or measured on the project area was 720 lbs/acre on the north side of Carr Butte, under a canopy of juniper, pine, and mountain mahogany.

2. Juniper-Sagebrush Plant Communities

Western Juniper/Low Sagebrush/Idaho Fescue - This is the potential plant association on shallow (less than 15 inches), clayey soils on basalt flows (Ecological Types 5A and 5B). These communities occur on 13,433 acres (26% of the project area). Tree cover (western juniper) ranges from zero to twenty percent, averaging 6%. Shrub cover ranges from zero to twenty percent, averaging 9%; shrub forage production ranges from zero to three hundred-sixty pounds per acre (lbs/acre), averaging 68 lbs/acre. Grass cover ranges from five to thirty percent, averaging 14%; grass forage production ranges from fifty to four hundred lbs/acre, averaging 206 lbs/acre. Forb cover ranges from one to twenty percent, averaging 8%, forb production ranges from five to four hundred-ten lbs/acre, averaging 119 lbs/acre. Bare soil and gravel account for forty to fifty-five percent of the ground surface, while litter cover averages 8%. Erosion potential is moderate to high. Water-holding capacity of the soil is low and herbaceous plant growth is generally limited to spring and early summer. Some regrowth of perennial grasses may occur with autumn rains. Juniper/low sagebrush communities are currently in satisfactory ecological condition, but cannot tolerate any decline in condition without risk of permanent loss of productivity.

Western Juniper/Wyoming Big Sagebrush/Thurber's Needlegrass-Bluebunch Wheatgrass - This type is the potential plant association on basalt flows with loamy soils and on shallow colluvial soils (Ecological Types 5Aw and 5BW). It is also found on the solitary volcanic shield on the allotment. This community occurs on 26,675 acres (51% of the allotment area), most of which is basalt flows (22,179 acres). Trees and shrub cover on flows are highly variable, both ranging from zero to thirty percent. Juniper cover averages 10%, as does shrub cover. Where junipers are densest (20% canopy cover), there is evidence of a declining shrub and herbaceous layer. Dead bitterbrush and big sagebrush interrupt expanses of bare soil. Shrub forage production ranges from an average of 25 lbs/acre on extremely rocky areas to 123 lbs/acre on less rocky areas. Grass cover ranges from ten the twenty percent, averaging 16%; grass forage production ranges from 165 lbs/acre to 420 lbs/acre, averaging 325 lbs/acre. Forb canopy cover ranges from one to twenty percent, averaging 10%; forb forage production ranges from zero to one hundred-eighty lbs/acre, averaging 120 lbs/acre. Bare soil and gravel cover averages 55% on the highly rocky moderately dissected flows, litter cover averages 20%. Erosion potential is moderate. Ecological condition on these loamy soil/moderately dissected flows (Ecological Type 5AW) is satisfactory (16,906 acres, 32% of the allotment). Areas with dense juniper need to be monitored carefully to prevent further decline. On highly dissected flows (Ecological Type 5BW), where there is much less rock, bare soil and gravel covers an average of 67% of the ground's surface, litter averages 7%. The high amount of bare soil predisposes the area to excessive erosion and colonization by undesirable plant species on this ten percent (5,273 acres) of the allotment. These areas are in unsatisfactory ecological condition. Two other areas of concern are the colluvial sideslopes of flows and faults, which occupy 3% and 5% of the allotment (Ecological Types 17 and 13). These areas have the potential to be highly productive and diverse. They are also very attractive to wildlife and livestock and receive heavy use. Some spots have as much as 70% bare soil and gravel, while others have as little as 25%. Litter cover ranges from 3 to 70%. Because of these wide ranges, it is impossible to designate ecological condition, but it is clear that the potential for widespread unsatisfactory condition exists.

3. Sagebrush Steppe Plant Communities
These communities occur on cinder cones, alluvial valleys, and clay basins. As a whole, this treeless formation takes up 7,541 acres (14%) of the allotment. These are the areas where seedings have been concentrated. Sagebrush species occurring here are low sagebrush, Wyoming big sagebrush, Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), and silver sagebrush (*Artemisia cana*).

Wyoming Big Sagebrush – Antelope Bitterbrush/Bluebunch Wheatgrass – Cusick's Bluegrass - This plant community occurs on cinder cones and occupies 1,409 acres (2%) of the allotment. This is Ecological Type 26CC. Juniper does occur here, but only in trace amounts (less than 1% canopy cover). Shrub and grass cover ranges from ten to thirty percent, averaging 20%. Shrub forage production ranges from twenty-five to two hundred forty-five lbs/acre, averaging 129 lbs/acre. Grass forage production ranges from forty-five to six hundred-sixty lbs/acre, averaging 296 lbs/acre. Forb cover ranges from on to ten percent, averaging 6%; forb forage production ranges from thirty-three to three hundred fifty-six lbs/acre. Bare soil averages 50%, litter averages 21% surface cover. The ecological status is satisfactory. Eighty-eight acres of this type is seeded to intermediate and crested wheatgrass. The seedings are in poor condition, with significant infiltration by native grasses and shrubs.

Wyoming Big Sagebrush - This is the potential plant community for loamy, alluvial valleys and drainages (Ecological Type 11A). Great Basin wildrye may also be part of the potential here, though it was not found in this setting on this allotment. No plots were done on this type. One thousand one hundred twenty-five acres of this type have been seeded, mostly to crested wheatgrass. According to ocular estimates, shrub cover is from zero to ten percent, grass cover is from ten to twenty percent, and forb cover is about three percent. Shrub and forb forage production is minimal, while grass production is in the 300-500 lbs/acre range. Bare soil is very high, about 80%. Litter cover is negligible. Because these areas have been type-converted, ecological condition is not an applicable concept. These seedings are in average condition, but have not achieved their full potential.

Low Sagebrush – Shrubby Eriogonum (*Eriogonum sphaerocephalum*) - This is the potential plant community on shallow clayey alluvial basins and drainages (Ecological Type 11). Four thousand five hundred seventy-eight acres of this type occur on the allotment area (9% of the allotment). Isolated junipers may occur here, but do not exceed 1% canopy cover. Shrub cover ranges from one to thirty percent, averaging 11%; shrub forage production ranges from zero to three hundred-fifteen lbs/acre, averaging 65 lbs/acre. Grass cover ranges from three to twenty percent, averaging 8%; grass forage production ranges from twenty to two hundred-fifty lbs/acre, averaging 111 lbs/acre. Forb cover ranges from one to forty percent, averaging 14%; forb production ranges from thirty-seven to three hundred-thirty lbs/acre, averaging 133 lbs/acre. Bare soil and gravel averages 53% of the ground surface. Erosion potential is moderate to high on this type, but the flatness of the terrain moderates movement of soil off the area. This type is in satisfactory ecological condition, but is near the lower threshold. This type has potential to provide quality sage grouse nesting and brood rearing habitat, due to its usual proximity to springs, seeps, and waterholes as well as its ability to provide appropriate forage and cover. Seedings have not been implemented on this type.

Basin Big Sagebrush - This type occurs on deep, loamy, skeletal colluvial soils on faults and the lower slopes of some cinder cones (Ecological Type 6 and 13CM). This type is not a major component of the Clear Lake allotment flora, occupying less than 1% of the project area. Approximately half of its area has been cleared and seeded to intermediate wheatgrass.

Silver Sagebrush - This type occurs on deep clay basins (Ecological Type 12). It too occupies less than 1% of the project area.

4. Medusa head Grasslands (Ecological Type 18)

This type occurs on extremely clayey areas where medusa head (*Taeniatherum caput-medusae*) has replaced the native shrubs (sagebrushes) and grasses. This substitution generally occurs when the native vegetation is removed, exposing bare soil. Rings of medusa head around artificial waterholes are an example of this phenomenon. Overutilization (grazing and trampling) by livestock and wildlife, as well as adverse climatic conditions, are other causes of medusa head establishment. There are 796 acres of medusa head grassland type on the allotment, plus an additional 543 acres where the plant was observed to occur (1,339 acres total, 2.5% of the allotment). Because of its ability to totally eliminate native species (woody, herbaceous, and cryptobiotic) from their range, to increase fire behavior in previously fire-resistant settings, and because of its extreme unpalatability to livestock and wildlife, all medusahead grasslands are considered to be in unsatisfactory ecological condition. However, it is also recognized that rehabilitation of these sites is very difficult due to lack of sufficiently aggressive revegetation species and by the lack of appropriate technologies for reseeding such clayey, cobbley soils.

Table 3-29: Acreages, Seral Stage, and Ecological Condition of Existing Vegetation on the Clear Lake Allotment – Modoc National Forest.

Ecological Type Description	Type Designation	Seral Acres	Ecological Stage	Condition
Pine-Juniper Woodlands				
Ponderosa Pine-Western Juniper/ Mountain Mahogany-AntelopeBitterbrush/Arrowleaf Balsamroot; Volcanic Shields	3	189	Potential	Satisfactory
Ponderosa Pine-Western Juniper; Highly Dissected Pliocene Volcanic	4	791	Potential	Satisfactory
Ponderosa Pine-Western Juniper/ Mtn. Mahogany/ Wyoming Sagebrush; Fault Scarp Colluvium	9	573	Potential	Satisfactory
Ponderosa Pine-Western Juniper; Horsts	21	143	Potential	Satisfactory
Ponderosa Pine-Western Juniper/ Mountain Mahogany – Serviceberry; Cinder Cones	26A	39	Potential	Satisfactory
Juniper-Sagebrush Savannas				
Western Juniper/Low Sagebrush/ Idaho Fescue; Moderately Dissected Pliocene Volcanic Flows	5A	2,522.5	Potential	Satisfactory
Western Juniper/Low Sagebrush/Bluebunch Wheatgrass - Idaho Fescue; Highly Dissected Pliocene Volcanic Flows	5B	10,911	Potential	Satisfactory
Western Juniper/Wyoming Sagebrush/ Needlegrass; Moderately Dissected Pliocene Volcanic Flows	5AW	16,906	Potential	Satisfactory
Western Juniper/Wyoming Sagebrush/ Needlegrass; Highly Dissected Pliocene Volcanic Flow	5BW	5,272.5	Potential	Unsatisfactory
Western Juniper/Mountain Mahogany/ Bluebunch Wheatgrass; Volcanic Shields	7	234	Potential	Satisfactory
Western Juniper/Wyoming Big Sage/ Bluebunch Wheatgrass; Trace Faults within Volcanic Flows	13	2,525	Potential	Satisfactory
Western Juniper/Wyoming Sagebrush/ Needlegrass; Volcanic Flow Colluvium	17	1,737	Potential	Unknown
Sagebrush Steppe				
Basin Big Sagebrush; Highly Dissected Pliocene Volcanic Flow and Colluvial Slopes	6	177	Potential	Satisfactory

Low Sagebrush-Shrubby Eriogonum/ Idaho Fescue-Sandberg Bluegrass; Alluvial Basins within Volcanic Flows	11	4,578	Potential	Satisfactory
Wyoming Sagebrush/Great Basin Wildrye; Fluvial Alluvium	11A	1,045	Seeded	Not Applicable
Bolander Silver Sagebrush; Fluvial Basins Fault Zone Complex	12	332	Potential	Unsatisfactory
Wyoming Big Sage/Antelope Bitterbrush/Bluebunch Wheatgrass-Cusick's Bluegrass; Volcanic Cinder Cones	26CC	1,409	Potential	Satisfactory
Other Types				
Medusa head-Autumn Willowherb; Fluvial Drainages	18	796	Potential	Unsatisfactory
Polygonum Species; Playas within Volcanic Flows	19	180	Potential	Satisfactory
Quaking Aspen; Fault Scarp Colluvium*	23	0	Potential	Satisfactory

* This type occurs in very small units that are not measurable at the scale mapped.

Noxious Weeds

Many noxious weed species have a competitive advantage over native species in areas disturbed by human activities. Within the Gerber/Willow Valley Watershed, human activities which have created disturbed conditions include timber harvest, grazing, and road construction. Consequently, noxious weeds have become established in a wide range of habitats, including riparian areas and wetlands, roadsides, campgrounds, rock pits, trails, forested and non-forested areas. These unwanted, introduced species have the potential to adversely affect species diversity, special status plant/animal species, range condition and forage production. Nine species of noxious weeds have been documented on federal lands within the watershed analysis area (Table 3-30). The 102 known noxious weed infestations are documented on lands managed by the Fremont National Forest and the BLM Klamath Falls Resource Area. Information regarding noxious weed populations on the Modoc National Forest is needed.

Table 3-30. Noxious Weed Sites in the Gerber/Willow Valley Watershed.

Common Name	Scientific Name	Number of Populations	Infested Area (acres)
Bull thistle	*Cirsium vulgare*	Numerous	——
Canada thistle	*Cirsium arvense*	46	17.7
Dalmatian toadflax	*Linaria dalmatica*	1	0.1
Leafy spurge	*Euphorbia esula*	14	53.9
Mediterranean sage	*Salvia aethiopsis*	4	2.0
Musk thistle	*Carduus nutans*	33	897.5
Russian knapweed	*Centaurea repens*	1	0.1
Scotch thistle	*Onopordum acanthium*	2	0.1
St. John's Wort	*Hypericum perforatum*	1	1.0
TOTAL	9 species	102	972.4

Musk thistle occupies the largest amount of acres within the watershed, and has the second largest number of populations, some of which are large. Musk thistle is a biennial plant that aggressively invades disturbed sites and can form dense stands eventually crowding out desirable plants. This thistle is generally found in forested areas that have been logged or can be found in other areas associated with ground disturbance.

Canada thistle has the largest number of populations within the watershed. Canada thistle has the capability to remain in relatively small populations for a number of years then increase exponentially. It is an aggressive colony forming perennial that reproduces by seed and from nodes on widely creeping horizontal roots that enable this plant to spread rapidly over large areas. This weed commonly invades riparian areas and has the capability to crowd out the native riparian flora, forming an extensive creeping root system that is currently controllable only by translocated herbicides.

Leafy spurge seems to be increasing within the watershed, with the third largest number of populations and the second largest number of acres occupies. Leafy spurge is also an aggressive colony forming perennial that reproduces by seed and by rhizomes. It has been reported to cause severe irritation of the mouth and digestive tract in cattle which may result in death. This species often forms large populations with extensive underground rhizomes that are most effectively controlled by translocated herbicides.

Threatened, Endangered, or Sensitive Plant Species

There are approximately 210 acres of special status plant species occupied habitat in the Gerber/Willow Valley watershed analysis area. Information regarding these species is presented in the following tables and narrative.

Table 3-31. Populations of Special Status Plant Species

Common Name	Scientific Name	Populations (#)	Occupied Habitat* (Acres)
Blue-leaved penstemon	*Penstemon glaucinus*	1	140
Long-bearded Mariposa lily	*Calochortus longebarbatus* var. *longebarbatus*	37	66
Baker's globe mallow	*Iliamna bakeri*	6	4
Profuse-flowered mesa mint	*Pogogyne floribunda*	2	40
Fringed campion	*Silene nuda* ssp. *insectivora*	numerous	——

*This represents only approximately 0.001% of the analysis area.

The long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*) grows in meadows, including low areas or drainages within low sagebrush (*Artemisia arbuscula*) scablands. The meadows appear to be mostly edaphically produced; the seasonally wet, heavy soils may preclude trees. The meadows are generally within forests of ponderosa pine (*Pinus ponderosa*), lodgepole pine (*P. contorta*), and western juniper (*Juniperus occidentalis*). A draft species management guide for the long-bearded mariposa lily was developed in 1991 by Thomas Kaye of the Conservation Biology Program of the Oregon Department of Agriculture, in consultation with Bruce Rittenhouse and Steve Popovich, botanists on the Fremont National Forest. An Interim Conservation Strategy for the long-bearded mariposa lily on the Winema National Forest was developed and signed by the botanists, TES coordinator, and forest supervisor in 1995.

Baker's globe mallow (*Iliamna bakeri*) commonly grows within plant associations which include western juniper, curlleaf mountain mahogany (*Cercocarpus ledifolius*), rabbitbrush (*Chrysothamnus nauseosus*), squaw carpet (*Ceanothus prostratus*), and sagebrush (*Artemisia tridentata*). Scattered or open ponderosa pine occurs on some sites. Dry hilltop sandy soils with little or no overtopping canopy is the preferred habitat. Many of the known populations are associated with recent burns. Several known populations initially located on 5-10 year old burns appear to have flourished briefly and then declined or disappeared. A conservation assessment was written for Baker's globe mallow in January 2000 by Robert W. Wooly, a botanist with the Fremont National Forest. The conservation assessment provides a review of current information about the taxonomy, range, distribution, habitat, ecology, and status of Baker's globe mallow in Northern California and Southern Oregon.

Profuse-flowered mesa mint (*Pogogyne floribunda*) grows in seasonal (vernal) wetlands characterized by silver sage (*Artemisia cana*). Until discovery of the Gerber area populations, this species was thought to be an endemic of the Modoc Plateau of northeastern California. Little is currently known about its ecology. In addition to silver sage, the Gerber populations were also associated with one-sided bluegrass (*Poa secunda* ssp. *secunda*), navarretia (*Navarretia intertexta*), and annual hairgrass (*Dechampsia danthonioides*). The

California populations are also associated with slender orcutt grass (*Orcuttia tenuis*), a plant listed as endangered under the federal Endangered Species Act.

Blue-leaved penstemon (*Penstemon glaucinus*) commonly occurs on dry sandy loam soils in clearings within lodgepole pine forests, from elevations of 6,700 feet to 8,100 feet. The lower elevation (6,700 feet) portions of the population on Yainax Butte occur under ponderosa pine also. Commonly associated species include lodgepole pine, white fir (*Abies concolor*), pinemat manzanita (*Arctostaphylos nevadensis*), snowbrush (*Ceanothus velutinus*), and sagebrush.

Fringed campion (*Silene nuda* ssp. *insectivora*) is found in relatively deeper soils of the sagebrush-steppe habitat, often associated with vernal streams and washes. Fringed campion is frequently associated with western juniper and big sagebrush dominated plant communities. Known populations seem to indicate that this species is somewhat tolerant to disturbance.

Table 3-32. Agency Status of Sensitive Plant Species.

Common Name	ONHP List	BLM Status	USFS Status	USFWS Status
Blue-leaved penstemon	NHP1	Bureau Sensitive	Sensitive	SoC
Long-bearded Mariposa lily	NHP1	Bureau Sensitive	Sensitive	SoC
Baker’s globe mallow	NHP1	Bureau Sensitive	Sensitive	None
Profuse-flowered mesa mint	NHP1	Bureau Sensitive	Sensitive	SoC
Fringed campion	NHP4	Bureau Tracking	None	None

NHP1: Oregon Natural Heritage Program list 1. Taxa that are endangered or threatened with extinction or presumed to be extinct throughout their entire range.
NHP4: Oregon Natural Heritage Program list 4. Taxa that are of concern, but are not currently threatened or endangered. Includes taxa that are very rare but currently secure, as well as taxa that are declining in numbers or habitat but are still too common to be proposed as threatened or endangered.
SoC: Species of Concern (Not an official status category under ESA). Includes species formerly categorized as Federal candidate list 1 species (USFWS has information to support proposing as endangered or threatened) or Federal candidate list 2 species (USFWS needs additional information before proposing as endangered or threatened). These are species that USFWS is reviewing for consideration as Candidates for listing under the ESA.

Special Areas

Special areas within the analysis area include a Research Natural Area (RNA), two Areas of Critical Environmental Concern (ACEC), and a Special Botanical Area. RNA’s are designated to preserve and protect examples of relatively undisturbed biological communities and the ecological processes that support those communities. These areas are available for short- or long-term scientific study, research, and education, and serve as a baseline against which human impacts on natural systems can be measured. An ACEC designation highlights an area where special management attention is needed to protect and prevent irreparable damage to important historic, cultural or scenic values; fish or wildlife resources; or other natural systems or processes; or to protect human life and safety from natural hazards. Special botanical areas were designated to protect, maintain, and/or restore specific botanical habitat values.

Table 3-33. Designated Special Areas within the Gerber Analysis Area.

Special Area	Designation Date	Size (Acres)	Reason for Designation
Bumpheads Special Botanical Area	June 1995	50	Undisturbed bunchgrass-shrub plant community
Goodlow Mountain RNA	February 1942	1,260	Ponderosa pine forest and transition to sagebrush steppe
Miller Creek ACEC	June 1995	2,000	Natural processes, wildlife, and scenic values
Yainax Butte ACEC	June 1995	720	Natural processes and systems, including special status plant species

Fire and Fuels

Fire/Fuels Management - BLM

The absence of fire and other activities associated with European settlement has created fuel loads across the western U.S. that exceed any known occurrence in history (Agee 1993). In the BLM Klamath Falls Resource Area (KFRA), these fuel loads range from 20 to 100 tons/acre. Historic accounts within our own century point to cyclic patterns of drought, which increase the scope and intensity of wildfire. The question is not if fire will occur, but when and how it will occur. When wildfire does occur, the results are not advantageous to any resource. Episodic events that occurred under the worst weather conditions in the previous decade have provided many examples of this phenomenon.

The ever-growing wildland-urban interface (WUI) areas within the Resource Area place the human inhabitants who live in these areas at ever-increasing risk. The development of adequate defensible space surrounding rural dwellings and using fire resistant building materials in construction is imperative if those dwellings are to survive an occurrence of wildfire.

Current management objectives attempt to mimic the historic regimes to which the landscape evolved. Since the Fuels Management EA was signed in 1994 (USDI-BLM 1994), the four basic objectives of the fuels management program for the BLM—Klamath Falls Resource Area have been:

-Reintroduce fire into areas in which fire has had a profound biological influence on ecosystem composition, structure, and function. Fire has played a major role in the early development and maintenance of plant associations in South Central Oregon.

-Restore sustainable function and structure to plant communities, which would improve forest health in fire-adapted ecosystems. This would include restoring forest (and other plant communities) composition from fire-intolerant species to fire-resistant species. The populations of encroaching white fir and western juniper would be reduced.

-Reduce major losses of sustainable ecosystem resources from catastrophic wildfire, which has resulted from heavy fuel loadings and vegetation changes that developed with “pseudo successful” total fire suppression. Reduce the potential for severe high-damage, forest overstory/stand replacing fires.

-Reduce overall fire management costs by reducing the number of large acreage multi-burn period fires (large fires burning over many days). Reduce the number and type of suppression resources needed in extended attack and project fire situations. The number and types of Initial Attack (IA) resources would remain unchanged. The BLM fire planning process would recognize the changes in the amount of burned area, fire intensity and adjust IA resources.

Wildfire suppression would still occur where prescribed fires are not planned and authorized. A Wildland Fire Situation Analysis would be prepared for each fire that is active and unconfined into a second burning period. The Lakeview District Fire Management Activity Plan (FMAP) would continue to be implemented. This activity plan describes the process for suppression of unplanned and unauthorized fires (USDI-BLM, 2002).

KFRA has conducted prescribed burning on an annual basis since 1980 and acquired considerable experience in prescribed fire application. Prescribed burning facilitated the suppression and lessened the severity of unplanned wildfires that occurred on the John Springs (1992) and Kitts Mill (1987) Fires. Prior to underburning, fuel loads in the ponderosa pine forests of the Gerber Block averaged 61 tons/acre. The average fuel weight that assures the overstory can survive wildfire is less than 14 tons/acre. Units underburned once averaged 23 tons/acre, which indicates that several burn treatments are required to achieve maintenance level. The 1994 Prescribed Fire EA (USDI-BLM 1994) established a system of dividing the watersheds into blocks called Fire Management Units (FMU). After the first two years, FMUs were selected for burning by a random process. FMUs for five years have been selected using a random number generator (or table) and grouped together for each year's operational area. Few ignitions would burn together; hence approximately 40% of the area would be burned. According to the KFRA Resource Management Plan, approximately 84,900 acres would need to be treated each decade to maintain the historic fire frequency level. The number of acres treated annually could vary considerably, due to the selection and review process.

Reintroduction of fire in forested areas, using restoration burns, would use 2 to 3 treatments within a ten-year period (1 to 2 would be spring burns). These areas would then use one fall or summer maintenance burn selected by random process on a 5 to 15 year cycle in lower elevation ponderosa pine zones. A 10 to 20 year cycle (mid elevation) would be planned for ponderosa pine and Douglas fir mixes (Mean Fire Interval (MFI) of 15 years for all ponderosa pine dominant communities) and a 30 to 50 year cycle for white fir/Douglas fir and red fir communities (MFI of 40 years). Grasslands and oak/juniper woodlands would be burned during seasons that are characteristic of the historic fire occurrence, at an MFI of 25-100 years. The random selection process would produce a wide variation of fire interval, which is an essential component that ensures diversity. Reintroduction of fire within acceptable ignition times would provide desired ecological results and create a stepped reduction of fuel beds.

The Clear Air Act (as amended) requires compliance with State Regulations. This creates a dilemma in areas where prescribed fire is necessary for ecosystem health and maintenance, because the desirable effects of fire are constrained by the impacts of smoke on human populations. The Klamath Falls Resource Area will comply with the Oregon Smoke Management Plan and the Oregon State Implementation Plan. Monitoring and evaluation of resource area burning will follow processes established by regulation and the Klamath volunteer smoke management process, which includes peer review.

Statistics gathered from fuels treatments that were conducted during the last 13 years (from 1980 through 2002) on BLM lands in the Gerber Block are displayed in Tables 3-34 and 3-35 below. To summarize the tables, the Klamath Falls Resource Area has treated 30,629 acres in the Gerber Block to reduce the fuel loadings, completing one to three treatments for an expenditure of $4,373,765. 75% of the acres were treated through prescribed burning, 23% by mechanical methods, and 2% by hand (chainsaw) treatments. Of the 23,229 acres treated through prescribed burning, 70% have been burned more than once.

The cost comparison table (Table 3-34) shows that 82% of the funds spent on fuels treatments were used in prescribed burning, 17% on mechanical treatments, and 1% on the hand treatments (although prescribed burning is less expensive per treatment, many acres have received multiple treatments). The hand and mechanical treatments will be followed by a second and possibly third treatment of prescribed burning, before the areas are considered to be in the maintenance category and scheduled for random selection in a recurring cycle that mimics more natural conditions.

Table 3-34: Fuels Treatments by Treatment Type in Gerber Block (BLM).

Treatment	**Cost/ Acre**	**# Entries**	**Acres/ Treatment**	**Cost ($)/ Treatment**	**Totals**	
					Acres	**Cost ($)**
Hand (chainsaws)	$350/ac	1	403	30,225	-	-
		2	63	9,450	466	39,675
Mechanical	$110/ac	1	6,934	762,740	6,934	762,740
Prescribed Burn	$75/ac	1	6,879	515,925	-	-
		2	8,311	1,246,650	-	-
		3	8,039	1,808,775	23,229	3,571,350
Total All Treatments					30,629	4,373,765

Note: Cost figures used are average prices to contract fuels treatments in 2002.

The majority of the fuels reduction treatments (51%) have occurred in western juniper vegetation types (15,532 acres). 7,643 acres (25%) of fuels management operations were done in ponderosa pine vegetation types; 6,984 acres (23%) were accomplished in non-timber types (mostly brush and grass); and 455 acres (1%) of mixed conifer types were treated. Table 3-35 shows acres of treatment by vegetation type. Map 3.4 (Appendix E) has locations of the completed BLM fuels treatments in the Gerber Block.

Table 3-35: Fuels Treatments by Vegetation Type in Gerber Block (BLM)

Vegetation Codes	**Mechanical (acres) ***	**Hand (acres) ***	**Prescribed Burn (acres) ***
Juniper	636	227	2,532
Agriculture	5	0	137
Big Sage, Bitterbrush	14	0	310
Deciduous Shrub	39	1	668
Dry Grass **	3	0	14
Juniper/Low Sage	4,177	142	7,805
Juniper/Sagebrush	6	0	7
Mixed Conifer	15	0	440
Low Sage/Grass **	1,471	31	3,549
Mountain Mahogany	12	3	623
Ponderosa Pine/Juniper	359	58	3,388
Regeneration	0	0	64
Ponderosa Pine	201	1	3,633
Rabbitbrush/Grass	0	0	40
Ponderosa Pine/Mountain Mahogany	0	0	3
Totals	6,938	463	23,213

* Number of acres in Table 3-34 does not agree with Table 3-35 due to rounding/splitting discrepancies.
** Invasive juniper was removed from the low sage/grass and dry grass vegetation types.

Fire/Fuel Management - USFS

The USFS is directed by the Federal Wildland Fire Management Policy and Program Review Final Report, December 18, 1995 (USFS-Washington Office) to use prescribed fire, from either management ignited or natural ignitions, in a safe, carefully controlled, cost effective manner as a means of achieving management objectives in Forest Plans. The policy has been developed for several reasons but primarily to provide for fire fighter safety by reducing the hazardous fuel loading and to reduce skyrocketing suppression costs of large fire suppression.

The Gerber Watershed Analysis area is comprised of ponderosa pine associated and mixed conifer ecotypes. The majority of the project area has had some degree of partial cutting of timber or timber stand improvement activities in the past. There is an increasing risk of catastrophic fire in the area due to understory development and elevated fuel loading, In addition some of the trees are dying or already dead, making stands very susceptible to crown fires given ignition. The existing condition in much of this area will promote high severity, stand replacement fire rather than the low severity understory fires. This condition is also contributing to an increased risk to fire fighters who are called to suppress these dangerous and destructive fires.

Approximately 35,000 acres within the analysis area have been prescribed burned previously. The Juniper underburn consisted of approximately 5,748 acres was burned in 1991. The Oriana underburn consisted of approximately 7,443 acres was burned in 1985 and again in 1994. The Beautiful underburn was about 7,000 acres in 1986 and 4,300 acres in 1995. The Deadman underburn was implemented on 4,200 acres in 1990, and the Goodlow underburn was 10,000 acres in 1998, 1999, 2001, and 2002. Of the 35,000 acres that have been previously underburned, 14,000 acres has been entered twice. The rest has only been entered once. Due to the heavy fuel loading it may take up to 3 entries to get the fuel loading down to the desired condition. In addition, the district has been burning in mosaic pattern and consequently only about 60% of these areas have actually been burned.

Fire managers are mainly interested in 0-3 inch material and fuelbed depth as these are the primary contributors to fire spread rate. However, large decaying fuels can be very susceptible to spot fires affecting fire spread. The Gerber Watershed Analysis Area is primarily within the Fremont Fire Occurrence Zone 3 and has a rate of 0.157 fires per year occurring per 1,000 acres. This occurrence zone reflects a high fire frequency on the forest. Existing fuel loading vary throughout the analysis area.

In the stands of ponderosa pine associated ecotype the fuel loading is best illustrated on pages 48 and 49 from the USDA Forest Service General Technical Report PNW-52, Photo Series for Quantifying Forest Residues. The residue descriptive code is 4-PP&ASSOC-4-PC. This fuel type is best represented by the standard fuel model 10 from the General Technical Report INT-22 with approximately 13 tons per acre of 0-3 inch down woody material and 21 tons per acre of down woody material. Fuelbed depth is approximately 1.3 foot.

In the stands of mixed conifer ecotype the fuel loading is best illustrated on pages 30 and 31 from the USDA Forest Service General Technical Report PNW-95, Photo Series for Quantifying Forest Residues. The residue descriptive code is 6-MC-4-PC. This fuel type is best represented by standard fuel model 10 from the General Technical Report INT-22 with approximately 17 tons per acre of 0-3 inch down woody material and 32 tons per acre of down woody material. Fuelbed depth is approximately 1.4 feet.

The Gerber Analysis area includes Fremont NF management areas 1, 2, 3, 5, 8, & 13. Fire Management Standards and Guidelines specific to these management areas are:

MA-1: Mule Deer Forage and Cover on Winter Range - Wildfire on winter range will be evaluated for appropriate suppression action. A natural fuels management plan for winter range will be developed through an interdisciplinary process.
MA-2: Endangered and Threatened Species - Bald eagle management areas are the highest priority for wildfire suppression if potential for damage to habitat is high. Fuels Management activities (including fuels treatment) will be evaluated for effect on nesting peregrines or hack sites. Fuel treatment by fire around active nest sites will take place outside nesting season (March 1 to July 15) if fire activities and smoke would affect nesting eagles.
MA-3: Old-growth Habitat for Dependent Species above the Management Requirement Level - Natural fuels management will take place in old growth areas only to meet old-growth habitat objectives. Old-growth areas should be priority for wildfire suppression.
MA-5: Timber and Range Production - Timber harvest, fuels treatment, and site preparation activities should strive not to damage residual trees. A suggested sequence of activities to include at year 3 to 5: Treat fuels,

protecting residual regeneration where feasible (prescribed fire should be strongly considered, both to reduce hazard and to control species composition).

MA-14: Old-growth Habitat to Provide Management Requirements for Dependent Species - Natural fuels management will take place in old-growth areas only to meet old-growth habitat objectives. Old-growth areas should be a high priority for wildfire suppression.

MA-15: Fish and Wildlife Habitat and Water Quality - Machine constructed fire lines should not be constructed in riparian areas during fire suppression activities. Perpendicular crossings, with subsequent rehabilitations, are permitted, but discouraged if alternatives exist. Use of prescribed fire will be limited to:

-Burning of activity fuels located in the upland portion of the Streamside Management Unit.

-Burning of natural fuels for the purpose of enhancing riparian dependent values.

III. Terrestrial Species and Habitat

The Gerber and Willow Valley watersheds contain many different major habitat types which can be broken down further into more specific habitat types. The terrestrial wildlife species that inhabit these specific habitat types are as variable and diverse as the flora itself. Table 3-36 shows some of the representative groups of species that are found within the various major habitat types. For a detailed wildlife species list, see Appendix A.

Table 3-36. Summary of major habitat types and representative wildlife species groups for the Gerber and Willow Valley watershed.

Habitat Types	Acres	Priority Habitat Feature	Representative species or species groups
Juniper	93,886	Old growth juniper trees	gray flycatcher, robin, bobcat, mule deer
Shrub	85,926	Big sagebrush stringers, bitterbrush, mountain mahogany	sage grouse, pygmy rabbit, Brewer's sparrow, pronghorn, mule deer, sagebrush lizard
Ponderosa Pine	68,145*	Large patches of old forest with large trees and snags, patches of burned old forest, open understory with regenerating pines	woodpeckers, nuthatches, goshawk, elk, mule deer, landbirds, bats
Mixed conifer	6,975**	Large and snags, grassy openings and dense thickets, multi-layered/ dense canopy, edges and openings created by wildfire	woodpeckers, nuthatches, goshawk, mule deer, elk, bats
Riparian-wet meadow	9,670	Deciduous trees, riparian shrubs, emergent vegetation, water spreaders	red-naped sapsucker (in aspen), waterfowl, shorebirds, garter snakes, bats, beaver
Conifer Regeneration	7,384	elk, mule deer, landbirds	
Grass	2,194	Native bunch grass areas	western meadowlark, horned lark, ferruginous hawk, rough-legged hawk (winter)
Water	6,468		waterfowl, shorebirds, osprey, bald eagle, bullfrog, turtles
Total	268,679		

*1,870 acres of late and old successional

**388 acres of late and old successional

Vegetation types identified in the Description of Vegetation Conditions (previous section) are grouped into major habitat types. The habitat types are summarized by subwatershed in Table 3-37.

Table 3-37. Acres of Habitat Types by Subwatershed

Sub-watersheds	Shrub-steppe; Juniper	Mixed Conifer	Mountain Mahogany	Ponderosa Pine	RB1-Grass; Riparian-Wet Meadow	Tree Regeneration	Water	Total
Antelope	22,598	213	255	3,013	898	0	198	27,176
Barnes	13,309	710	2,026	10,217	2,028	0	343	28,634
Ben Hall	1,022	426	91	7,126	302	2,135	17	11,118
Buckmaster	574	406	76	3,533	294	652	0	5,485
Dry Prairie	13,923	277	457	5,357	726	186	395	21,322
East Gerber Frontal	9,242	610	329	4,324	222	326	102	15,156
Horse Canyon	3,425	1,836	323	7,900	948	3,300	27	17,759
Long Branch	7,481	838	598	4,982	368	633	76	14,977
Miller	20,662	105	131	3,084	2,199	27	291	26,498
Pitch Log	8,685	455	247	5,369	111	0	583	15,450
Rock Creek	20,788	633	1,101	8,129	947	0	102	31,700
Upper Lost River Frontal	15,172	17	35	1,314	48	0	121	16,706
West Gerber Frontal	9,529	448	511	3,709	1,571	125	3,569	19,461
Willow Valley	16,494	0	2	88	9	0	645	17,238
Total	162,854	6,975	6,183	68,145	10,670	7,384	6,468	268,679

A herpetological survey is ongoing in the Gerber Watershed area. Numerous species of reptiles and amphibians have been documented by this study (see Appendix A).

Roads impact numerous wildlife species in several ways. Road use can cause direct harm to wildlife (road kill), and the road prism is a direct reduction of wildlife habitat. Many species are sensitive to the disturbance caused by road use and many species are vulnerable to human predation as a function of road use. Road density can be used as an index of direct harm, disturbance, and vulnerability. Acres of road surface can be used to determine habitat removed by roads. Table 3-38 summarizes terrestrial acres removed by roads and road densities by subwatershed.

Table 3-38. Acres of terrestrial habitat removed by roads and road densities by subwatershed.

Subwatershed	Gross Acres	Terrestrial Acres	Square miles (terrestrial)	Miles of Road	Acres of Roadway	Road Density (miles/square mile)
Antelope	27,176	26,978	42	63	115	1.50
Barnes Valley	28,634	28,291	44	119	216	2.69
Ben Hall	11,118	11,101	17	52	95	3.02
Buckmaster	5,485	5,485	9	30	55	3.51
Dry Prairie	21,322	20,927	33	82	149	2.51
East Gerber Frontal	15,156	15,054	24	34	61	1.43
Horse Canyon	17,759	17,732	28	92	167	3.31
Long Branch	14,977	14,900	23	46	84	1.97
Miller Cr	26,498	26,207	41	60	110	1.48
Pitch Log	15,450	14,867	23	49	90	2.12
Rock Cr	31,700	31,598	49	86	157	1.75
Upper Lost River Frontal	16,706	16,585	26	29	53	1.12
West Gerber Frontal	19,461	15,892	25	42	77	1.70
Willow Valley	17,238	16,592	26	36	65	1.38
Total	268,679	262,209	410	821	1,492	2.00 (average)

Threatened, Endangered, and Sensitive Species

Species of Concern (SOC)

Bald Eagle - (Threatened, Proposed for De-listing) - Bald eagles use the analysis area for foraging, roosting and nesting. Their potential habitat exists where large, open-branched ponderosa pines are present near open water foraging habitat. The multiple reservoirs and nearby stringers of large pines in the watersheds seem to provide suitable habitat that results in successful reproduction. Many of the large live and dead ponderosa pines that are vital to bald eagles have been negatively affected by juniper encroachment. Invasive junipers take advantage of microclimate characteristics around large pines and, therefore, create intense competition for resources.

Isaacs and Silovsky (1991) characterized potential eagle nesting and roosting areas for the Fremont National Forest and identified portions of the Gerber Watershed as potential habitat. Anthony and Isaacs (2002) identified six active bald eagle nest sites in the Gerber Watershed. Nest locations included one on Goodlow Mountain, four around Gerber reservoir and one near Tull Lake. One nest site was found in the Willow Valley Watershed, near Antelope Reservoir. Another bald eagle nest is located on the Modoc NF near Walter Flat. A bald eagle management area (BEMA) is designated around and includes Gerber Reservoir (approximately 15,057 acres of which 3,792 is Gerber Reservoir). The Fremont National Forest has identified three areas as BEMAs. The following table summarizes the acres in these management areas.

Table 3-39. Bald eagle management area and acres.

BEMA Number	Acres
P05	1,698
635	931
P09	1,160

American Peregrine Falcon - (R-6 Regional Forester's Sensitive Species List; recently De-listed from Endangered) - Peregrine falcons need suitable nest sites, usually cliffs, which overlook fairly open areas with an ample food supply. They typically nest and roost relatively close to water where waterbirds or other prey species are plentiful (Csuti et al 1997).

The Lakeview District BLM was surveyed for peregrine falcon habitat in 1999. The purpose of this survey was to serve as a springboard for future surveys and monitoring by the BLM, to ascertain peregrine presence, and to contribute in monitoring the peregrine falcon recovery in Oregon, per recommendations by the USFWS under the delisting decision. Within the Gerber watershed a fifteen-acre area of Miller Creek is identified as peregrine habitat. Two specific areas in Miller creek canyon below Gerber dam were considered to be potential nest sites. One received a high potential for nests rating and the other received a medium potential rating (Pagel, 1999).

Since the habitat rating procedure, both of these sites have been surveyed to protocol (Pagel 1989) and no peregrines have been detected. However, prairie falcons have been detected and have occupied both sites. It is possible that prairie falcons start breeding and nesting behavior earlier in the year than peregrines, and therefore are better suited to occupy these nest sites (Sitter, personal communication, 2002). Good foraging habitat exists primarily, around Gerber, Round Valley, and Upper midway reservoirs, along Miller creek and around nearby wet meadows, ephemeral lakes and agricultural fields. In the fall of 1999, Pagel documented peregrine falcons use of the Miller Creek area of the Gerber watershed. There have been occasional sightings of peregrines on the Modoc NF portion of the Willow Valley watershed. No other areas have been identified.

Northwestern pond turtle - (Federal Species of Concern; Bureau Assessment Species in Oregon) - The northwestern pond turtle is listed as a BLM Bureau sensitive species in Oregon, a federally designated Species of Concern, a state listed sensitive critical species and an Oregon Natural Heritage Program list 1 species (ONHP Feb. 2001). This aquatic turtle is typically found in lakes, ponds, marshes, rivers and streams with muddy or rocky bottoms (Csuti et al, 1997) and requires adequate forage, basking sites, nesting and overwintering habitat. Factors that have likely influenced pond turtle populations and distribution may include riparian reduction and degradation, altering of waterways causing hydrologic changes and introduction of non-native predators (largemouth bass, bullfrog, etc.). There is an ongoing herpetological inventory of the Gerber watershed and this study may help us better understand northwestern pond turtle abundance and distribution.

Sightings of northwestern pond turtles have been documented in the Gerber/Willow Valley Watershed, mostly along the main access road leading to Gerber Reservoir. However there appears to be little potential for northwestern pond turtle habitat in the watersheds. Primarily, the aquatic habitats would be near springs along major tributaries. Most of the ponds/reservoirs in the watersheds are locked up as ice during the winter months and most of the streams are dry in the summer providing very little sustained suitable habitat for this turtle species. Retention of riparian communities and the use of best management practices for constructing roads and landings, grazing activities, and protecting potential nesting and overwintering areas may mitigate most potential habitat losses.

Bats - The silver-haired bat, pallid bat, Yuma myotis, long-legged myotis and long-eared myotis are Federal Species of Concern and Bureau Tracking Species in Oregon. In the watersheds, these bat species are all closely associated with older ponderosa pine, mixed conifer or juniper forests. They are dependent on riparian zones and permanent water. Maternal colonies, roosting sites and overwintering sites are typically associated with large snags, cliffs, caves, mines, buildings and/or bridges.

The Gerber watershed currently has several older, artificial roosting structures that are known to have large numbers of bats using them. Additional structures (bat boxes) have been erected recently throughout the watershed. Surveys have not yet been completed in the analysis area in order to ascertain abundance and distribution of bat species. Current habitat conditions are likely suitable to sustain some level of bat use.

Bat populations are likely being affected by continued riparian habitat degradation in some areas and negative impacts from juniper encroachment on large trees used for roosting.

Great Gray Owl - (BLM Survey and Manage Species, State Sensitive Vulnerable in Oregon) - Great gray owls typically hunt for rodents in meadows (wet and dry), clear-cuts and other open areas. They have been known to use a variety of habitats and nest in existing cavities, broken tops of snags, or large nest structures usually in mature conifers. Because this owl is a large bird with a considerable wingspan, it has been found to prefer nesting in large trees with well-spaced branches.

As a species of the higher latitudes of North America, the analysis area is situated near the southern most part of its range. It is thought that the great gray has been expanding its range in Oregon in recent history, taking advantage of openings in forests created by timber harvest practices (Csuti et al 1997).

Three great gray owl detections have been formally documented within or close to the eastern boundary of the Gerber watershed. The detections were documented on USFS land. The first was a single adult seen north of Horsefly Mountain and the second was two adults seen west of Arkansas reservoir. The third was two adults and one fledgling seen near Upper Barnes Valley creek.

Natural meadow systems important to great grays for foraging can be vulnerable to juniper, lodgepole pine and other types of encroachment. It has been realized that these owls can effectively hunt over other types of openings typical of some timber harvest practices. Large live trees and snags can be negatively affected by wildfires since fuel loads, including ladder fuels, have not been controlled like they were before fire suppression efforts. Mature, live trees preferred by these owls for nesting can be negatively impacted by juniper and other types of encroachment.

Big Game

The Gerber and Willow Valley watersheds provide fair to good habitat for mule deer and other large ungulate species. No specific information is available for the California portion of the Willow Valley watershed, although this area is known as extremely important winter range for mule deer and pronghorn. The watersheds include portions of the ODF&W Interstate Management Unit for deer and elk and the ODF&W South-Central Elk Management Zone.

All seasonal habitats are in a state of advanced plant succession and thus have a reduced capacity to support big game. Forage availability in LOS stands has declined as density and structure within these stands has increased. An increase in the density and distribution of juniper at lower elevations has reduced the productivity of herbaceous and woody forage, but has increased cover. Riparian habitat conditions for fawning, calving and rearing were degraded since the turn of the century by heavy livestock and ungulate grazing. Due to management within the last decade, these areas have improved. Road densities on National Forest lands exceed the minimum desired condition for habitat security (USFS, 2000).

Mule Deer - In the Gerber and Willow Valley watersheds, mule deer inhabit sagebrush plains, canyons and rimrock areas. When pressured by hot weather or predation, they typically use juniper, pine or mixed conifer stringers or thickets. They are also known to use riparian areas. During the summer and fall mule deer can become nocturnal as they mainly move into suitable shrub areas to browse at night. They usually migrate to lower elevations during the winter in search of shallower snow depths and available forage. Wintering deer in 1998/1999 were estimated at 35% (Interstate) of management objective. Although Interstate herd count numbers are low, this is thought to be due to poor weather conditions during the count (Hedrick, personal communication). Currently, the overall mule deer population appears to be on a slight upward trend (USFS, 2000).

Logging activity from the 1950's through the 1990's has created openings and increased edge habitat in the forest landscape, improving overall foraging conditions on summer ranges. Hiding and thermal cover has decreased and motorized access to summer ranges has increased. Deer numbers during this period fluctuated greatly. Population indices, calculated to 5-year averages, peaked in the early 1960's and reached their lowest levels in the early 1980's. The Interstate deer populations peaked in the 1950's and have since declined by 60%. The population has been relatively stable in the last 20 years and appears to be within the carrying capacities of seasonal ranges (USFS, 2000).

Cover, both hiding and thermal, though plentiful, is generally poorly distributed throughout the watersheds. Around 50% of the analysis area is classified as non-forested and may not be able to produce significant amounts of cover. Cover utilized in these areas may not meet current Resource Management Plan (RMP) definitions, but may nevertheless function as big game cover. Forage is highly variable over the watershed. Concentrations of high quality forage, primarily grasses, forbs, and sedges associated with riparian areas, meadows and small openings are distributed throughout the watershed. Sagebrush, bitterbrush, mountain mahogany, bitter cherry and chokecherry occur at lower elevations and forest edges.

The watersheds are almost entirely within the boundaries of the Interstate deer herd range. The area includes summer, transitional and winter ranges within the Klamath Falls and Interstate management units. Most of the watershed analysis area is considered transitional and summer range (Salwasser, 1979). The area south of Willow Valley Reservoir is considered winter range and many of the summering deer from the north migrate to this area. Other summering deer migrate from the Dry Lakes winter range to the southwest in California. Depending on weather and forage, mule deer can use all parts of the watersheds as habitat during the year.

A summary of winter range acres is not available because it is incompletely mapped in the watersheds. However, the Clear Lake area of the Doublehead Ranger District in California is considered a critical winter range area for mule deer. Interstate mule deer herd populations were low in the early 20th century, increased to a maximum in the late 1940s through the mid-1960s, then declined (Salwasser 1979). Populations appear to be relatively stable at a much lower level than the 1960s maximum.

<u>Elk</u> **-** Elk are the largest wild ungulate species found in the analysis area. They are primarily grazing animals, preferring a diet of grasses and some forbs. In winter they may turn to browsing trees, shrubs or other woody vegetation (Csuti et al 1997). Elk forage in meadows, clearings or other early seral areas with a grass component. Like mule deer, when pressured by weather and/or hunting or other predation, elk can become nocturnal.

Elk and suitable elk habitat are distributed throughout the watershed. Elk can use all parts of the watersheds as habitat during the course of a year. Calving areas are generally associated with riparian, meadow, and/or moist soil sites, although additional, less consistently used calving habitat undoubtedly exists in suitable sites throughout the watershed. Migration corridors for elk are primarily between summer range and winter ranges to the north and east. Although wintering and calving areas are not mapped for the area, several areas in the eastern parts of the watersheds have been used as winter range.

The elk population in the South-Central Elk Management Zone, estimated at 1,300 animals, was steadily increasing as of 1997. The current number of elk in the management zone is not known, however, the population is expected to continue growing and expanding into unoccupied habitat until it reaches equilibrium with the habitat's carrying capacity. It is expected that the population management objective will be attained by 2010. The management objective for the South-Central Elk Management Zone is 2,000 animals (Hershey, personal communication 2000). Population numbers specific to the Gerber and Willow Valley watersheds are not available.

Pronghorn - In the Gerber and Willow Valley watersheds, the pronghorn is mainly a species of sagebrush flats and grasslands. Low sagebrush and associated forbs are important forage components of preferred pronghorn habitat. In the analysis area, these animals have been known to use juniper and pine clumps and stringers for hiding and bedding cover. The Clear Lake area of the Doublehead Ranger District in California is considered a critical winter range area for pronghorn.

Sagebrush steppe and native grassland habitats have been and continue to be affected by juniper encroachment, some grazing practices, noxious weeds and changes in fire activity.

For the purpose of this document open environments such as big sage/bitterbrush, dry grass, juniper, low sage/grass, rabbitbrush/grass and riparian/wet meadow vegetation types are assumed to be pronghorn habitat. Total habitat (62% of the watershed analysis area) is summarized in the following table.

Table 3-40. Pronghorn habitat by subwatershed

Subwatershed	Acres
Antelope Creek	23,300
Barnes Valley	14,786
Ben Hall	1,076
Buckmaster	702
Dry Prairie	14,228
East Gerber Frontal	9,343
Horse Canyon	4,167
Long Branch	7,548
Miller Creek	22,699
Pitch Log	8,405
Rock Creek	21,199
Upper Lost River Frontal	15,124
West Gerber Frontal	10,962
Willow Valley	16,499
Total	170,038

Terrestrial Species Associated with Late/Old Successional (LOS) Forest Habitats

LOS forest cover has declined since 1950, and species composition has changed in pure ponderosa pine to a more mixed conifer forest. Little LOS ponderosa pine remains as single story stands. In general, habitat for species associated with open, park-like single canopy LOS ponderosa pine stands has declined while multi-storied more mixed conifer LOS habitat has increased. LOS habitat increases however have been somewhat negated by reduced continuity within a landscape fragmented by early and mid-seral patches. Average and maximum patch sizes of late/old seral forest have been reduced. Many patches that historically functioned as interior habitat now function as ecotone (edge) habitat and late/old forest cover is now strongly influenced by edge effects due to habitat fragmentation. Average road densities per square mile have added to the increase in edge and reduction of interior habitat (USFS, 2000).

The Fremont-Winema National Forest has dedicated old growth patches approximately 5 miles apart across the landscape of the northern tier of watersheds. There are clusters of non-dedicated old growth near the Goodlow RNA and to the extreme northeast in the Barnes Valley subwatershed. Except for the upper Barnes Valley old growth area, all are islands with poor connectivity across the northern tier. There is a small amount of old growth ponderosa pine or mixed conifer forest across the BLM parts of the watersheds. Late and old successional Forest habitat is not mapped consistently across the watersheds. Table 3-41 summarizes acres of old growth by major vegetation types by subwatershed.

Table 3-41. Acres of Old Growth by vegetation type by subwatershed.

Subwatershed	Juniper	Mountain Mahogany	Ponderosa Pine	Mixed Conifer
Antelope Creek	0	0	0	0
Barnes Valley	90	603	1,023	76
Ben Hall	0	0	53	0
Buckmaster	0	0	0	0
Dry Prairie	9	28	161	18
East Gerber Frontal	0	6	21	34
Horse Canyon	51	16	249	96
Long Branch	32	0	122	132
Miller Creek	36	0	136	28
Pitch Log	0	0	0	0
Rock Creek	0	0	0	0
Upper Lost River Frontal	0	0	0	0
West Gerber Frontal	4	48	105	4
Willow Valley	0	0	0	0
Total	222	701	1,870	388

Northern Goshawk - Northern goshawks are known to be agile flying forest birds. They typically prefer large patches of late-successional mixed conifer or ponderosa pine forest with considerable canopy closure (Csuti et al 1997). They hunt both birds and mammals and like to use corridors within stands for hunting and travel lanes. Northern goshawks usually build stick nests in or under the canopy and aggressively defend nesting territories. In the analysis area, it is thought that the loss of LOS forests has caused a decline of this species.

Six goshawk nest sites have been documented in the Gerber watershed. Four were found around Goodlow Mountain, one was detected near upper Barnes Valley Creek, and one northeast of Round Valley Reservoir. Goshawks have recently been sighted on BLM land in the northeastern Gerber watershed during early spring migration. No suitable nesting habitat occurs within the Willow Valley watershed.

Assuming that ponderosa pine and mixed conifer old growth, as mapped, provide suitable habitat for goshawks, there are 2,258 acres of suitable habitat in the watershed analysis area, which is approximately 3 percent of the total ponderosa pine and mixed conifer in the watersheds. On the Fremont-Winema National Forest and BLM, 30 acres (at a minimum) of the most suitable nesting habitat surrounding the nest site is deferred from harvest. These thirty acres include known alternate nest sites and plucking posts. On the Fremont, a 400-acre post-fledging area is designated around each active nest site and is comprised of the best available habitat. A minimum of sixty percent of the post-fledging area is managed as LOS. Projects are designed to avoid or minimize disturbance during the bonding and nesting period, April 1 through August 30. On the Modoc NF, breeding sites are Protected Activity Centers (PACs) of 200 acres of the best available forested habitat surrounding nest sites (or, if the nest cannot be located, the location of territorial adults or recently fledged juveniles during the fledgling dependency period) in the largest contiguous blocks possible.

Pileated Woodpecker - The pileated woodpecker is closely associated with forest habitats that have large trees, especially snags, for nesting and foraging. In the watersheds, it has been known to prefer large ponderosa pine stands with some fir component. This species may forage in more open areas, but typically needs forests over seventy years old for nesting. Conversion of older forests, with snags and downed logs, to even-aged, short rotation forests, is a major factor in reduction of pileated woodpecker habitat (Csuti et al 1997). It is unknown if suitable nesting habitat occurs within the Willow Valley watershed.

These large woodpeckers have been documented around Goodlow Mountain and likely occur in LOS pockets in the eastern part of the Gerber watershed.

Assuming that ponderosa pine and mixed conifer old growth, as mapped, provide suitable habitat for pileated woodpecker, there are 2,258 acres of suitable habitat in the watershed analysis area, which is approximately 3 percent of the total ponderosa pine and mixed conifer in the watersheds.

<u>American Marten</u> - American martens are associated with forested habitats at a variety of elevations. They prefer mature forests with closed canopies, but will at times use openings within stands if there is enough downed wood to provide ample cover. The structure of a forest stand has been shown to be more important to a marten than the type of forest (Ingles 1965). Studies have shown that martens may use early to mid-seral forest if suitable den sites (slash piles, etc.) are available (Hayner, personal communication 2003).

The marten uses large downed logs, log piles or hollow trees for dens. These can be typical characteristics of mature forests, and marten populations may be declining in some areas due to lack of den sites. .

During an ongoing forest carnivore study, the BLM and USFS have documented American martens around Goodlow Mountain. Other LOS pockets in the Gerber watershed have been surveyed and likely contain suitable marten habitat (Kellam, personal communication, 2003).

<u>Black-backed/White-headed Woodpecker</u> - In the analysis area, the black-backed woodpecker typically inhabits mature ponderosa pine forests in the lower half of the areas elevational range. It excavates its own nest cavity, usually in pine snags (Csuti et al 1997). This woodpecker has been documented in several areas within the watersheds. It is normally detected in or adjacent to LOS stands with good snag numbers.

The white-headed woodpecker is closely associated with ponderosa pine or ponderosa pine/mixed conifer forests. It requires large trees for foraging, and snags for nesting, which are characteristic of older forests. One Oregon study found that these woodpeckers spent most of their time foraging in trees larger than twenty inches in diameter (Csuti et al 1997). The white-headed woodpecker has been documented incidentally and during surveys within the analysis area.

These two woodpeckers, along with others, have diets that mainly consist of wood boring beetles and their larvae. They are likely critical in keeping these beetles and other pest populations under control. Foraging opportunities may have increased across the watersheds in association with increased bark beetle activity in recent years. Overstory mortality occurring in large diameter pine and fir in recent years from drought, overstocked stands, and an increase in disease and insect activity may have also created additional snag habitat to improve nesting habitat conditions and prey availability.

Past forestry practices that replace older stands with younger forests reduce potential habitat for the black-backed and white-headed woodpeckers. Availability, continuity, and suitability of habitat in ponderosa pine and mixed conifer habitats have declined over the past 50 years. Sanitation and salvage logging has limited the availability and abundance of this suitable habitat (USFS, 2000). Currently, the Fremont-Winema and the BLM manage some areas of the watersheds for LOS forest.

Their populations could also be affected by changes in fire frequency or intervals that change natural snag recruitment cycles. Assuming that ponderosa pine and mixed conifer old growth, as mapped, provides suitable habitat for black-backed and white-headed woodpeckers, there are 2,258 acres of suitable habitat in the watershed analysis area.

Terrestrial Species Associated with Sagebrush Steppe Habitat

The Gerber and Willow Valley watersheds contain many thousands of acres of sagebrush steppe habitat. A large percentage of this habitat type in dominated by low sagebrush, where as a small percentage is dominated by big sagebrush. Other components include antelope bitterbrush, mountain mahogany, grasses and an increasing amount of western juniper. Some terrestrial species of wildlife in the analysis area are considered sagebrush obligates, and others utilize these habitats during certain parts of the year.

Western Sage Grouse - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Suitable habitat for sage grouse is found where relatively large, open areas of low and/or big sagebrush and wet meadows/ephemeral lakes occur. These birds require large, virtually treeless areas of low sage habitats for breeding/drumming sites or leks. Areas with a substantial big sage component and associated forbs are vital for nesting, brood rearing and wintering. Although these types of habitats occur within the watershed, their suitability as sage grouse habitat has been altered by juniper encroachment, historic grazing practices, noxious weeds and changes in fire activity.

Since the analysis area geographically lies on the edge of this birds historic range, population numbers were probably historically lower than other, more classic sage grouse habitat areas.

Six historical leks have been identified in the analysis area (See Table 3-42). There have been several recent incidental sage grouse detections near Gerber reservoir, Round Valley reservoir and Bumpheads reservoir. Most of the more recent sightings have been associated with reservoir edges, ephemeral lakes/meadows or water spreaders near Round Valley reservoir.

Table 3-42. Western Sage Grouse Lek Locations

Name	Detections	Watershed	Status
Casebeer Ranch	Historic	Gerber	Historical
Round Valley	Within last 10 years	Gerber	Historical
N. Gerber Res.	Historic	Gerber	Historical
Bumpheads	Within last 10 years	Willow Valley	Historical
Dry Prairie 1	Within last 10 years	Gerber	Historical
Dry Prairie 2	Within last 10 years	Gerber	Historical

Table 3-43 summarizes acres of potential nesting habitat (big sagebrush/bitterbrush) by subwatershed. Total potential nesting habitat is approximately 3 % of the total watershed analysis area.

Pygmy Rabbit - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Pygmy rabbits are thought to be closely associated with areas supporting tall, dense areas of Great Basin or big sagebrush. They also require deep, relatively loose soil to dig their burrows. They are a unique rabbit in that they dig their own extensive burrow system and are active all year long and throughout the day (Csuti et al 1997).

The abundance and distribution of these rabbits is currently not well understood in the analysis area. It is typically thought of as a Great Basin species, therefore the Gerber and Willow Valley watersheds are geographically positioned on the edge of their range. In the Gerber watershed, big sage stringers occur as only a small percentage of the total acres, and even a smaller percentage in the Willow Valley watershed. The health of these big sage areas varies from site to site. Most have been negatively impacted by juniper encroachment, conversion of sagebrush habitats to exotic grasslands, some grazing practices, noxious weeds and changes in fire activity. Road systems and widespread clearings seem to be barriers to dispersal (Csuti et al 1997). In Lake County to the east of the analysis area, BLM biologists have surveyed land within the Lakeview Resource Area for pygmy rabbits. They have been documented in small islands or small stringers of big sagebrush surrounded by other shrub or grass dominated habitats (Forbes personal communication, 2003).

Recently, pygmy rabbits were detected and photographed by biologists employed by a private consulting firm on the eastern slope of Bryant mountain, about ten miles west of the Gerber watershed boundary. They were found in big sage/bitterbrush habitat with low to moderate juniper invasion (Huddleson, personal communication 2002).

Table 3-43. Sage grouse nesting habitat by subwatershed.

Subwatershed	Acres
Antelope Creek	341
Barnes Valley	1,568
Ben Hall	181
Buckmaster	58
Dry Prairie	2,149
East Gerber Frontal	123
Horse Canyon	600
Long Branch	500
Miller Creek	682
Pitch Log	706
Rock Creek	1,338
Upper Lost River Frontal	188
West Gerber Frontal	266
Willow Valley	33
Total	8,734

Terrestrial Species Associated with Aspen/Deciduous Riparian Habitat

Approximately 9,670 acres of riparian and wet meadow habitat exists within the watersheds. Table 3-44 shows that only 68.5 acres of aspen are present on BLM land. There is likely as many or more acres of aspen on the Fremont-Winema National Forest sections of the watersheds, however, no information is available. Aspen stands tend to be relatively small and scattered throughout the analysis area where conditions are suitable. Distribution is generally restricted to moist/wet sites associated with riparian areas or seasonally wet areas. These stands seem to be tied to specific sites within other plant communities where moisture is sufficient and in drainages, riparian zones or depressions. Many aspen stands are decadent, with heavy conifer/juniper encroachment, and little regeneration. Other than the species discussed below, there are numerous wildlife species in the analysis area that utilize aspen/riparian habitats exclusively or periodically during the year.

Table 3-44: Acres of Aspen by Sub-Watershed

Subwatershed	Acres
Antelope Creek	3.3
Ben Hall	2.6
Dry Prairie	2.6
East Gerber Frontal	10.6
Long Branch	19.8
Miller Creek	4.5
Pitch Log	16.8
Rock Creek	0
West Gerber Frontal	6.3
Willow Valley	0

Total	68.5

Red-naped/Red-breasted Sapsucker - These sapsuckers are found in variety of coniferous forest communities that contain an aspen component. They also can be detected using riparian woodlands with healthy deciduous trees. These birds have very similar feeding habits in that they both drill holes in deciduous trees and feed on the cambium and sap, as well as the insects that are attracted to the sap (Csuti et al 1997).

Both the red-naped and the red-breasted sapsuckers have been documented within the analysis area. Typically, the red-breasted is seen and heard more often than the red-naped.

Late and old aspen clones, the preferred habitat of both red-naped and red-breasted sapsuckers, are distributed throughout the watershed. Many clones are in a mature, declining to overmature, or decadent condition with little regeneration evident. The limited regeneration displays light to severe damage from cattle grazing and/or ungulate browsing. Many clones are being overtopped and out competed by conifers/ junipers, further contributing to the decline of the stand (USFS, 2000). Many aspen areas show no or limited regeneration due to changes in the fire regime.

American Beaver - The American beaver is a large, aquatic rodent that can live throughout the watersheds nearly anywhere there is permanent water. They are strict herbivores and aspen and willow are its preferred foods. Potential habitat occurs in riparian areas with deciduous vegetation and low gradient streams. Beavers are known for modifying their environment by building dams across waterways to create ponds.

No formal surveys to determine beaver presence have occurred within the watershed. Documented evidence of beaver activity and anecdotal information indicates beaver presence within both the Gerber and Willow Valley watersheds, though colony locations have not been determined. Colony locations may be difficult to determine as some beavers have been shown to use banks as denning sites, rather than the traditional damming and lodge building activities normally associated with beaver presence.

Other Terrestrial Species

Herptiles - A herpetological survey is ongoing in the Gerber Watershed area. Numerous species of reptiles and amphibians have been documented by this study (see Table 3-45). There are 18 potential herptile species in the Gerber watershed. Ten herptile species were detected in the Gerber watershed in 2002. Plans to conduct an inventory in the Willow Valley watershed have been made.

Osprey - The osprey is a bird specialized for catching fish. It nests and typically roosts in areas within close proximity to lakes, rivers and other bodies of water and waterways. It requires suitable nest sites such as large dead or dying trees or artificial nesting platforms.

There are currently (2001) eight known osprey nest sites that are considered active. There are ten historic nest sites that have unknown status or where nests or nest structures have been degraded to the point of non-use (Table 3-46). Ospreys have been known to rebuild/reuse nests in the same area year after year or build a nest in the same area in a different specific location. No information is available for the Modoc NF portions of the watersheds.

Table 3-45. Herpetofauna of the Gerber Watershed – Potential/Documented.

Herpetofauna of the Gerber Watershed Common name (Scientific name)	Species detected in 2002	Species previously documented (all survey methods)
Amphibians		
Western toad (*Bufo boreas*)		X

Pacific chorus frog (*Pseudacris regilla*)	X	
Bullfrog (*Rana catesbeiana*)2	X	
Great Basin spadefoot (*Spea intermontana*)		
Long-toed salamander (*Ambystoma macrodactylum*)		
Reptiles		
Northwestern pond turtle (*Clemmys marmorata*)		X
Western skink (*Eumeces skiltonianus*)	X	
Short-horned lizard (*Phrynosoma douglassi*)		
Northern sagebrush lizard (*Sceloporus graciosus*)	X	
Western fence lizard (*Sceloporus occidentalis*)	X	
Rubber boa (*Charina bottae*)		X
Yellow-bellied racer (*Coluber constrictor*)	X	
Western rattlesnake (*Crotalis viridus*)	X	
Night snake (*Hypsiglena torquata*)		
Striped whipsnake (*Masticophis taeniatus*)		
Gopher snake (*Pituophis melanoleucus*)	X	
Western terrestrial garter snake (*Thamnophis elegans*)	X	
Common garter snake (*Thamnophis sirtalis*)	X	

Table 3-46. Osprey Nest Sites in the Gerber/Willow Valley Watersheds.

Nest Site	NameOwnership	Nest Status-2001	Watershed
Stan H Springs I	BLM	Nest gone	Gerber
Stan H Springs II	Private	Active	Gerber
Stan H Springs III	BLM	Nest gone	Gerber
Stan H Springs IV	BLM	Active	Gerber
Miller Creek I	BLM	Nest gone	Gerber
Miller Creek II	BLM	Nest gone	Gerber
Miller Creek III	BLM	Active	Gerber
Miller Creek IV	BLM	Active	Gerber
Round Valley Res. I	BLM	Nest gone	Gerber
Round Valley Res. II	BLM	Active	Gerber
Upper Midway	BLM	Unknown	Willow Valley
Barnes Valley I	BLM	Active	Gerber
Barnes Valley II	BLM	Unknown	Gerber
Adobe Flat	Private	Unknown	Willow Valley
Rock Creek	BLM	Unknown	Willow Valley
Long Branch	BLM	Unknown	Gerber
Antelope Reservoir	BLM	Active	Willow Valley

Landbirds - The predominant habitat type in the Gerber Watershed and in most subwatersheds is shrub-steppe/juniper. Within this major type, sagebrush communities - particularly those associated with deeper soils - are of concern because their extent and health have been affected by a variety of factors including fire suppression, grazing, noxious weeds (cheat grass), and climate change. These vegetation communities provide the structural complexity needed to support a greater variety of bird species than the low sage community occurring in the scab-rock flats; however, both communities are important for their own suite of bird species. Sagebrush obligate songbird species include Brewer's sparrow and sage thrasher. Some songbird species are associated with open or patchy shrub habitats due to the presence of native grasses upon which they depend. Species associated with native perennial grasses include Vesper sparrow, lark sparrow, horned lark, and western meadowlark. Other important habitat relationships include the ecotonal edges of herbaceous, shrub and tree habitats, and old growth juniper habitats. Lark sparrows tend to be associated with habitats where there is an interspersion of shrubs and juniper. Gray flycatchers are associated with shrubs and mature juniper. Shrub communities dominated by mountain mahogany and bitterbrush are important for species including the green-tailed towhee.

Bird census stations are present in several shrub and juniper sites in the Gerber and Willow Valley Watersheds. The goal of this study is to collect baseline data and establish monitoring for juniper harvest management. Objectives include determining which shrubland obligate bird species are present in shrub habitats with different degrees of juniper invasion and determining bird species diversity after juniper management. Results to date indicate that of the sagebrush obligate species with potential to occur in the area, Brewer's sparrow, vesper sparrow, and gray flycatcher do occur. Green-tailed towhee and lark sparrow were also detected. Riparian dependent species detected included song sparrow and black-headed grosbeak. A point count route was established in the Gerber Watershed within juniper and sage habitat in 1998. The point count route is surveyed under a cooperative study with the Redwood Sciences Lab (RSL) and the Klamath Bird Observatory (KBO).

A constant mist-netting station was set up along Barnes Valley Creek and other sites in 1998 and has been run annually between May and October by the RSL and KBO personnel. The purpose of this station is to determine bird species diversity, abundance, and trend during both the breeding and migration seasons, especially for riparian dependent species. Another objective of this mist-netting station is to determine how the riparian habitats within the watershed function for songbirds during the migration season. Riparian dependent bird species captured at the site, not previously detected during point count censusing, include orange-crowned warbler, calliope hummingbird, yellow warbler, MacGillivray's warbler, willow flycatcher, Wilson's warbler, and Lincoln's sparrow.

IV. Human Uses

Timber

Refer to the "Management" discussions in the *Vegetation – Forested Upland* section under "Ponderosa Pine" and "White Fir/Mixed Conifer" subsections.

Grazing

As the livestock grazing use is discretely administered on the National Forest and BLM lands, they will be addressed separately in this section.

BLM Administered Lands - (The "Gerber Block")

There are 18 grazing allotments that lie all or partially within the BLM administered portions of the analysis area. They vary in size, forage allocation, season-of-use, etc., though all are permitted for cattle grazing use (except for the Campbell Allotment, which is horse permitted). The following table outlines the basic parameters for the grazing use of each of the allotments:

Table 3-47. BLM Grazing Allotments and Authorized Use.

Allotment			Permitted Use**(AUMs)		Acres Administered	
Name	#	Season-of-Use*	Active	Suspended	BLM	Private
"J" Spring	0803	5/1 - 6/30	7	0	320	260
Paddock	0844	5/1 - 6/30	31	0	440	240
Yainax***	0861	7/1 - 9/30	120	0	2,520	0 ****
Bear Valley	0876	7/1 - 8/7*****	475	0	5,018	4,780
Bumpheads	0877	4/21 - 6/30	420	265	9,220	220
Campbell	0878	5/1 - 10/26	47	13	1,465	3,140
DeVaul	0879	5/1 - 8/30	12	15	240	320
Goodlow	0881	5/1 - 8/31	32	52	285	640
Horsefly	0882	4/15 - 6/30 & 10/1 - 11/15	2,656	2,075	26,356	4,779
Horton	0883	4/21 - 5/20	58	211	800	342
Pankey Basin	0884	5/15 - 8/31	43	39	282	508
Dry Prairie	0885	5/1 - 9/15	642	358	7,231	3,624
Horse Camp Rim	0886	5/1 - 7/31	445	331	9,180	40
Pitchlog	0887	5/10 - 6/30	434	796	9,280	1,040
Rock Creek	0888	5/1 - 5/31	216	639	2,750	1,200
Timber Hill	0889	6/21 - 7/31	270	134	2,937	760
Willow Valley	0890	4/15 - 6/30	1,320	444	20,460	887
Williams	0892	5/1 - 5/31	75	0	1,790	0

* Season-of-use as currently leased/permitted.
** As listed in the 1995 Klamath Falls Resource Area ROD/RMP, Appendix H. One AUM (Animal Unit Month) equals one cow/calf - or equivalent - grazing for one month. Suspended AUMs (resulting from a 1958 range survey) can not be used.
*** Only a portion of this allotment is within the analysis area, though the acreage figure is for the entire allotment.
**** The Yainax allotment is several parcels of BLM lands, immersed in a huge block of USFS and private land, though no private was listed in the ROD/RMP. See allotment specific write-up.
***** Use of the predominately private Bear Valley flat pasture occurs after the normal season-of-use in late August to September. See allotment specific write-up.

Overall grazing within the Gerber Block is currently at levels much lower than during the "free range" period that extended from significant settlement of the area in the 1870's up to the passage of the Taylor Grazing Act (TGA) in 1934. By the 1880's in some locales, and over the entire West by the early 1900's, it was commonly acknowledged that virtually all of the public domain was tremendously overstocked with cattle, sheep, and horses. Even though the rangeland overuse problems were well known, federal legislation to remedy the problem was delayed for decades due to a public (and legislative) inability to move beyond the now idealized homesteader era (all the truly arable farming lands were taken by the 1880's) and an entrenched public dislike for the "cattle barons", who were perceived (inaccurately) as the only beneficiary of public rangeland control legislation. In the end, the primary blame was usually assigned to the itinerant sheep bands - including in the analysis area - though all the grazing users had blame proportional to their grazing use. However, the politics of the public land use situation invariably favored local land owners. Thus, it was the roaming livestock operators that were the primary target of and almost totally excluded by passage of the TGA (Peffer 1951).

Although the precise levels of livestock grazing are largely unknown during this period, immediately after passage of the TGA a list of "Potential Allottees and Livestock Ownership - Grazing District No. 1" noted that there were 26,708 head of sheep and 6,772 head of cattle being grazed within the Gerber block during the accessible seasons; a season that generally averages from mid-March to mid-November. High as this figure is, it did not include the "...itinerant herds which, in former years, had passed through the area in search of food." (Beckham 2000)

A conservative estimate of the pre-TGA grazing use in the BLM Gerber Block would be 30,000 to 40,000 AUMs yearly, and very likely it was often twice that level of use. (As a comparison, the neighboring Fremont National Forest (FNF) has documentation showing that in 1915 approximately 500,000 AUMs were being utilized yearly on 850,000 acres of FNF land. Currently, about 50,000 AUMs are being actively used on an expanded 1+ million acres of FNF.) Overgrazing damage inflicted during the "free range" era is still evident in parts of the analysis area, particularly in the southwestern portion of the Gerber Block; an issue that is discussed at length elsewhere in this analysis.

In 1937-1938, a rangeland forage survey was completed by the Grazing Service (precursor to the BLM) for the Gerber Block. The purpose of this survey was to appropriately allocate forage to qualified, local private property owners (a process known as "adjudication") and attempt to get the actual grazing use in tune with the capacities of the land. This resulted in dramatic decreases in the numbers of livestock (horses, sheep, and cattle) on public lands and began the era of federal control over the public domain. Specifically, approximately 15,000 AUMs of active grazing use was adjudicated to the grazing permittees by 1940. Another range survey was performed in the 1958 for the "Bonanza Unit", which included all the section 3 grazing lands within or immediately adjacent to the Gerber Block. Based on that survey, substantial grazing reductions were made effective starting with the 1960 grazing year. Livestock use by this time was virtually all cattle. Though the average reduction of grazing use in the Gerber Block was 43% from the post-TGA adjudications, the actual amount in a given allotment ranged from no reduction to almost 80%. Currently, as a comparison to the previously noted pre-TGA grazing levels, there are no sheep grazing permits in the Gerber Block and the total maximum number of cattle permitted is 2300 to 2400 head with an average season of use of about 3 months. There is a total of 7170 AUMs currently permitted in the analysis area, which is slightly more than half of the KFRA total.

The BLM grazing allotments within the analysis area vary in importance from the highest priority in the KFRA - the endangered sucker consultation allotments in the north Gerber Block - to some of the lowest. This latter group usually consists of small BLM parcels intermingled with private lands making management difficult at best. In the early 1980's and again in the early 1990's, all the grazing allotments in the KFRA were ranked according to importance, based on a set of resource and social criteria. The most recent ranking was done during the KFRA RMP/EIS process, which was ultimately affirmed and accepted by the subsequent KFRA ROD/RMP, issued in June 1995. The ranking of allotments for the purpose of concentrating management efforts on the places that can benefit most is still BLM policy. Allotments are ranked in order of descending importance as either "I" category (for "Improve"), "M" category (for "Maintain"), or "C" (for Custodial) - "C" being the lowest management classification. See the KFRA ROD/RMP, Appendix H, pages H-69-70, for more information on allotment categorization.

The RMP process also outlined by allotment, "Identified Resource Conflicts/Concerns" - both known and suspected - with a related "Management Objective" for each Conflict/Concern. These are summarized by allotment in the KFRA ROD/RMP, Appendix H, pages H-5 through H-64. Some allotments have many Conflicts/Concerns and Objectives identified for them; others have none. A list of all the pertinent ones are included below, with each grazing allotment's write-up referencing which ones pertain to it:

Identified Resources Conflicts/Concerns	**Management Objectives**
1. Under current management the range productivitycondition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.	Maintain or improve rangeland condition and through a change in grazing management practices, timing, and/or level of active use.

2. No forage allocations for elk use in the allotment have been made.	Allocate forage to meet elk forage demands.
3. Critical deer winter range occurs of in allotment.	Management systems should reflect the importance deer winter range.
4. Special status species and/or habitat exists within the allotment.	Prevent significant risk to well-being of special status species and/or habitat from BLM- authorized actions. Grazing use and management will be consistent with the biological opinion for the allotment.
5. Wetlands habitat in less than satisfactory condition.	Improve wetlands habitat condition to satisfactory or better condition.
6. Riparian or aquatic habitat is in less than good condition.	Maintain or improve riparian or aquatic habitat in good or better condition.
7. Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.	Maintain and improve water quality on public lands to meet or exceed standards for beneficial use.
8. Grazing management system established but not formally documented.	Revise existing allotment management plan.
9. Potential for grazing/recreation conflicts within the allotment.	Grazing management should consider recreation concerns.
10. Potential Area of Critical Environmental Concern (ACEC) within this allotment.	If designated, grazing management will be consistent with the ACEC management plan.
11. Active erosion occurs in the allotment.	Maintain or improve erosion condition in moderate or better erosion condition.

The KFRA ROD/RMP also outlined allowable use level objectives that would generally be applied to the grazing use within the Resource Area - both upland and riparian. The allowable use levels were developed as a set of definitive criteria to assist in the managing rangeland vegetation on a sustained yield basis. The table was intended to be a guideline that would be tempered by site-specific information and judgment. The tables from the KFRA ROD/RMP are reiterated below. (See ROD/RMP pages H-74 through H-77 for more information.)

Table 3-48. Degree of Allowable Use (Percentage) for Upland Vegetation

Plant Category	Spring	Summer	Fall	Season-Long
Perennial grasses & grasslike	50	50	60	50
Perennial & biennial forbs	50	50	60	50
Shrubs, half shrubs & trees	30	50	50	45
Annual grasses & forbs	No annuals are expected to be key species			

Table 3-49. Degree of Allowable Use (Percentage) for Riparian Vegetation

Utilization Standards in Riparian-Wetland Areas	Proper Functioning Condition Herbaceous	Proper Functioning Condition Woody	At Risk or Non-functioning Herbaceous	At Risk or Non-functioning Woody
Riparian Areas with Management	50	50	0-40	0-35
Riparian Ares without Management	40	30	0-30	0-25

Various levels of rangeland monitoring studies have been initiated and continue to be read on most of the high priority allotments in the analysis area. The lower priority allotments in the analysis area have widely variable amounts of monitoring information collected on them, including nothing on several. Grazing related vegetation monitoring includes various types of upland trend, condition, and/or utilization studies, as well as a mix of riparian/meadow related studies. These rangeland monitoring studies for the Gerber Block are fully explained, and the schedule for their implementation and reading found, in the KFRA's *Coordinated Monitoring and Evaluation Plan for Grazing Allotments*. This plan, located in the KFRA office, was completed in 1994 and is updated at least once yearly. An analysis of the pertinent monitoring information collected to date, by allotment, is included in Step 5, the "Human Uses - Grazing" section. As noted earlier, an Ecological Site Inventory (ESI) survey was also completed for the Gerber Block in 1997-1998. This survey provides a "snapshot" of the current ecological conditions of the area (vegetation and soils) as well as descriptions or estimates of the site potential for all the major vegetation types. ESI is covered more comprehensively the Vegetation section.

In some allotments with little or no previous monitoring, rapid qualitative condition assessments have been completed on representative upland areas. This recently developed process for uplands - similar to the riparian Proper Functioning Condition (PFC) assessments - is outlined in the just issued (late 2000) Interagency Technical Reference TR-1734-6, titled *Interpreting Indicators of Rangeland Health*. To quote that reference, "This technique, in association with quantitative monitoring and inventory information, can be used to provide early warnings of resource problems on upland rangelands." It more specifically provides "...a preliminary evaluation of soil/site stability, hydrologic function and integrity of the biotic community (at the ecological site level)." Numerous indicators for "Soil Site Stability", "Biotic Integrity", and "Hydrologic Function" are observed in the field and rated during this process as to similarity/departure from an appropriate baseline (i.e. ecological site description or a "good" to "excellent" condition reference area). The process consummates ultimately in an overall ranking within each of the three categories and an overall estimate of upland resource functionality. In areas with no monitoring information, this procedure provides a logical process for quickly estimating if significant problems exist. If so, and the area warrants the increased attention, additional studies/monitoring would be implemented to identify the cause(s) of resource problems and provide increased information from which to make future informed management changes. This procedure and subsequent documentation will be referred to in this analysis, for lack of an official name, as an "upland PFC assessment". (NOTE: The draft version of TR-1734-6 was used for the field assessments completed during the fall of 2000.)

In August 1997, the "Standards for Rangeland Health and Guidelines *for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington*" was signed by the Secretary of Interior and implementation begun. This and other pertinent policy guidance requires that all BLM grazing lands be assessed to see if the current grazing management is meeting the 5 Standards for Rangeland Health and Guidelines for Livestock Grazing Management. The 5 Standards are as follows:

Standard 1: Watershed Function - Uplands

Standard 2:	Watershed Function - Riparian/Wetland Areas
Standard 3:	Ecological Processes
Standard 4:	Water Quality
Standard 5:	Native, T&E, and Locally Important Species

An assessment uses existing information to determine if the grazing management is meeting, or moving towards meeting, all of the *Standards for Rangeland Health*. The assessment also determines if the grazing management is in conformance with the *Guidelines for Livestock Grazing Management*. A guideline is "…a practice, method, or technique determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting the standard. Guidelines are tools such as grazing systems, vegetative treatments, or improvement projects that help managers and permittees achieve standards…" (USDI BLM 1997)

If not meeting, or making significant progress towards meeting all the Standards and the Guidelines, then grazing management would be changed in order to begin making sufficient progress. For many of the 18 allotments in the analysis area, this watershed analysis will function as the *Rangeland Health Standards Assessment*; and such is noted by allotment below. However, most of the higher priority allotments have already had assessments completed in 1999-2000. The *Rangeland Health Standards Assessment* portions of this watershed analysis will follow the general procedural guidance found in BLM Manual H-4180-1 - Rangeland Health Standards (USDI BLM 2001). (Note: A full copy of the Oregon/Washington Standards and Guidelines information and guidance is found at the following URL - http://www.or.blm.gov/Rangelands/s&gfinal.htm)

The following section contains brief, allotment specific narratives, which provide more pertinent details for each of the 18 allotments in the analysis area. This includes grazing systems, resource priorities, and other facts and issues of importance. The discussions will also note which allotments will have this analysis function as its *Rangeland Health Standards Assessment*:

"J" Spring Allotment (0803)

This allotment is located just to the northeast of Gerber Reservoir in the northern portion of the Gerber Block. It is a low priority ("C" category), late spring use allotment which was grazed in common with a similar sized parcel of private lands - where the actual "J" Spring is located. However, in 1999, the private lands were fenced separately leaving the BLM as a discrete pasture. The KFRA ROD/RMP did not identify any specific "Identified Resources Conflicts/Concerns" related to the livestock grazing on this allotment. Due to the low priority of the allotment, typical rangeland monitoring studies have not been established/read on this allotment. However, the ESI survey and an upland PFC assessment were done relatively recently. The information from these efforts will be presented in Step 5. Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Paddock Allotment (0844)

This allotment is located north of Gerber Reservoir, in the extreme northern portion of the Gerber Block. It is also a low priority "C" category, late spring use allotment that for many years was grazed in common with a portion of the Gerber Ranch private meadow lands. Because it was grazed in common with private, grazing use always extended beyond the permitted season-of-use end date of 6/30. In 1996, a division fence was constructed on the eastern private/BLM boundary, effectively eliminating the unauthorized (after 6/30) use and allowing for discrete grazing use of the BLM lands. The KFRA ROD/RMP did not identify any specific "Identified Resources Conflicts/Concerns" related to the livestock grazing on this allotment. Due to the low priority of the allotment, typical rangeland monitoring studies have not been established/read on this allotment. However, the ESI survey and an upland PFC assessment were done relatively recently. The information from these efforts will be presented in Step 5. Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Yainax Allotment (0861)

This allotment is located on the extreme north end of the analysis area, on and around Yainax Butte and the adjacent Klamath Forest Estates area. At least half of this fragmented allotment lies outside the watershed boundaries; only the BLM lands on the south side of Yainax Butte proper are within the analysis area. It is a medium low priority “M” category allotment that is included as a minor component of the Yainax Butte Coordinated Resource Management Plan (CRMP) area. This 118,000 acre CRMP area is 70% U.S. Forest Service lands with large blocks of intermingled private lands (21%) and a relatively small amount (6%) of BLM administered lands, of which an even smaller part is in this analysis area. The Yainax Butte CRMP is a cooperative planning effort that guides the management efforts on these lands, regardless of ownership. Grazing use of the area was the primary driving force in the initiation of the CRMP about 20 years ago. The plan was extensively revised in the early 1990’s.

The KFRA ROD/RMP listed two specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment - #3 & #10 off the previously itemized list. Some limited monitoring information has been collected on this allotment through the years and Ecological Status Inventory was completed in late 2002. The *Rangeland Health Standards Assessment* for this allotment is scheduled for completion in 2004 and not as part of this analysis, though this document will assist in the preparation of that Assessment when done.

Bear Valley Allotment (0876)

This mid-summer grazing use allotment is located in the southeastern portion of the Gerber Block around the private Bear Valley meadow (a large Ephemeral Lakebed ecological type). It is a moderately high priority “I” category allotment that has a high percentage of unfenced, privately owned lands, intermingled with the BLM administered lands. The allotment is divided by fencing into three pastures - North, South, and Bear Valley. The North and South pastures are grazed on a deferred rotation system, with the predominantly (~80%) private Bear Valley pasture always being used as the third and last pasture in the late summer into the early fall.

The KFRA ROD/RMP listed four specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment - #1, #6, #7, & #11 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had an ample amount of monitoring data collected on it over the past 25 years, including trend and condition information, utilization, and riparian photo points. The *Rangeland Health Standards Assessment* for Bear Valley was completed in 2000 and found that the overall current grazing use was appropriate (more fully covered in Step 5). Most of the private lands in the allotment outside of the separately fenced Bear Valley (which is owned by the grazing permittee) are owned by a private timber company. The private lands are grazed in common with the BLM permitted lands, though the grazing permittee does not have a separate lease for these lands; a legal occurrence under the state’s “open range” laws. This is a fairly common occurrence in portions of the analysis area with intermingled private lands.

Bumpheads Allotment (0877)

This mid to late spring use allotment is located in the southwestern portion of the Gerber Block. It is a moderately high priority “I” category allotment that is divided into three pastures (West, North, and South - in order of increasing size) that are grazed on a deferred rotation system. This allotment has virtually no intermingled private lands but does adjoin private lands owned by the grazing permittee along its entire western boundary. Bumpheads has approximately one-half of its acreage in the watershed analysis area, though it must be considered as a whole for continuity of grazing analysis.

The KFRA ROD/RMP listed four specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment - #1, #3, #8, & #9 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had an ample amount of monitoring data collected on it over the past 25 years, including various trend and condition information, utilization, and riparian photo points. This information has shown some variably degraded ecological conditions in portions of the allotment, particularly in the Woolen Canyon area (far western 1/3 of the South Pasture) and in much of the small, West pasture. However, most of the allotment is in acceptable ecological condition with the trends static to upwards (more fully covered in Step 5). Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for the Bumpheads allotment.

Campbell Allotment (0878)

The Campbell allotment is located north of Lorella, in the extreme northwestern BLM portion of the analysis area. It is a low priority “M” category allotment where the BLM lands are combined with a much larger area of privately owned lands and probably grazed at various times throughout the season. All of the BLM lands are in the extreme northern portion of the allotment and physiographically divided into two parts - above and below Goodlow Rim. The portion above the Rim (about 2/3 of the BLM administered lands) has historically received limited grazing use, largely in conjunction with the adjacent Fremont NF lands. The portion below the Rim (approximately 1/3 of the BLM) is grazed in common with the private lands owned by the permittee.

The KFRA ROD/RMP listed one specific “Identified Resources Conflict/Concern” and related “Management Objective” for this allotment - #6 off the previously itemized list (riparian habitat). This objective pertains to the BLM administered portion of Pankey Lake (about half is BLM, and half USFS). Pankey Lake is a spikerush (*Eleocharis* spp.) dominated “pothole” meadow (Ephemeral Lakebed ecological site). The only allotment specific vegetation/monitoring data was collected via an upland PFC assessment completed during October 2000 in the area above Goodlow Rim and to the west of Pankey Lake. The information from that evaluation will be presented in Step 5. Note: This watershed analysis will not serve as the *Rangeland Health Standards Assessment* for this allotment; it is being prepared independently as a separate document.

DeVaul Allotment (0879)

This small late spring and summer use allotment is located on the extreme northwestern edge of the Gerber Block. It is a low priority “C” category allotment that, due to lack of division fencing, is grazed in common with the private meadow lands in and around DeVaul Lake. The BLM administered lands are primarily ponderosa pine and juniper dominated uplands with limited livestock grazing use, though cattle may be present on the BLM into the fall.

The KFRA ROD/RMP listed one specific “Identified Resources Conflict/Concern” and related “Management Objective” for this allotment - #6 off the previously itemized list. This objective pertains to a small corner of BLM administered land which edges into DeVaul Lake and is not fenced separately from the majority private lands. DeVaul Lake is a spikerush (*Eleocharis* spp.) dominated “pothole” (Ephemeral Lakebed ecological site). Besides the ESI survey, the only allotment specific vegetation/monitoring information was collected via an upland PFC assessment completed during October 2000. The information from that evaluation will be presented in Step 5. Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Goodlow Allotment (0881)

Goodlow is a late spring and summer use allotment located immediately north of the DeVaul allotment, on the extreme northwestern edge of the Gerber Block. It is also a low priority “C” category allotment that is immediately adjacent to private lands, but was largely fenced separate several years ago.

The KFRA ROD/RMP did not identify any specific “Identified Resources Conflicts/Concerns” related to the livestock grazing on this allotment. Besides the ESI survey, the only allotment specific vegetation/

monitoring data was collected via an upland PFC assessment completed during October 2000. The information from this evaluation will be presented in Step 5. Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Horsefly Allotment (0882)

Horsefly is located in the center north portion of the Gerber Block and is the largest (acres and AUMs) and probably most important grazing allotment in the KFRA. As such, it is also one of the highest priority "I" category allotments. It has a dual season of use - mid spring to early summer and again in early to mid fall (see previous table). It is one of three allotments that has been under formal section 7 (Endangered Species Act) consultation since 1994, due to the presence of the endangered shortnose suckers in Gerber Reservoir and its tributaries - particularly Barnes Valley and Long Branch Creeks. The allotment is grazed on a 9 pasture, "flash" (high intensity, short duration) rest-rotation grazing system where cattle are moved relatively quickly from pasture to pasture, with 2-3 pastures rested during the growing season each year. The fall use in October is concentrated in the artificially seeded and irrigated Round Valley Water Spreader pasture with rotating trail use areas for the cattle movement back to the ranch in November. Important riparian areas are either exclosure fenced (Long Branch Creek) or fenced into separate riparian pastures (Barnes Inlet and Barnes Valley Riparian Pastures) with extremely limited and infrequent licensed use (i.e. for the B.V. Riparian Pasture it is 5-10 days once every three years). Casebeer Creek, in the Norcross pasture of the Horsefly Allotment, is almost completely contained within privately fenced pasture (including some portions on BLM land). There is one small watergap in the fence which is on BLM land.

The KFRA ROD/RMP listed nine specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1 through #9 off the previously itemized list. This allotment has had extensive amounts of rangeland monitoring studies established and read on it over the past 30+ years; and in particular, during the past 8 years due to the consultation requirements. These include various condition and trend studies, utilization, and a mix of riparian related studies in addition to the ESI survey. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999. That assessment and the section 7 consultations, have affirmed that the current grazing management continues to be appropriate (discussed in Step 5).

Horton Allotment (0883)

The Horton allotment is located north of Lorella, in the extreme northwestern BLM portion of the analysis area. It is also another low priority "C" category allotment that is grazed in the spring in conjunction with private lands to the west of the allotment. The livestock water for this allotment is provided by an irrigation ditch on those private lands. The BLM lands have received extensive juniper control activities (cutting, piling, and burning) and bitterbrush planting over the past several years directed towards improving habitat conditions for wildlife.

The KFRA ROD/RMP listed three specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1, #3 & #9 off the previously itemized list. Other than one year of utilization pattern mapping (2000), the only allotment specific vegetation/monitoring data was collected via an upland PFC assessment completed during October 2000. The Rangeland Health Standards Assessment for this allotment, completed in 2002, affirmed that current grazing management continues to be appropriate (discussed in Step 5).

Pankey Basin Allotment (0884)

The Pankey Basin allotment is located on the northwestern edge of the Gerber Block and is another low priority "C" category allotment. It is a mid spring through summer use allotment that is intermingled and used in conjunction with a larger amount of private land. Most of the water for the allotment is on private lands, with the rougher and steeper lands surrounding the private being the BLM permitted areas. The BLM lands appear to receive only limited use even though they are not fenced separate from the private. A short stretch of Pankey Creek does flow across BLM lands, in an area of cattle accessibility, and may have some riparian condition issues.

The KFRA ROD/RMP listed two specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #6 & #7 off the previously itemized list. Besides the ESI survey, the only allotment specific vegetation/monitoring data was collected via an upland PFC assessment completed during October 2000. The information from this evaluation will be presented in Step 5. Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Dry Prairie Allotment (0885)

Dry Prairie is located in the northwestern quarter of the Gerber Block and is one of the larger and more important grazing allotments in the KFRA. As such, it is also one of the highest priority "I" category allotments. It does, however, have a relatively high amount of intermingled private lands, most of which are either owned or leased by the grazing permittees. The season of use is mid-spring through summer and is one of the three allotments that have been under formal section 7 (Endangered Species Act) consultation since 1994, due to the presence of the endangered shortnose suckers in Gerber Reservoir and its tributaries. The allotment is permitted as a 6 pasture, rest-rotation grazing system where at least one major pasture is fully rested each year for rangeland health enhancement. The important riparian area - Ben Hall Creek - is fenced into a separate riparian pasture with extremely limited and infrequent licensed use (i.e. 10 days once every three years).

The KFRA ROD/RMP listed eight specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1 - #3 and #5 - #9 off the previously itemized list. This allotment has had extensive amounts of rangeland monitoring studies established and read on it over the past 30 years; and in particular, during the past 8 years due to the section 7 consultation requirements. These include various condition and trend studies, utilization, and a mix of riparian related studies, in addition to the ESI survey. The *Rangeland Health Standards Assessment* for this allotment, completed in 1999, and the section 7 consultations have affirmed that the current grazing management continues to be appropriate (more fully discussed in Step 5).

Horse Camp Rim Allotment (0886)

The Horse Camp Rim allotment is located in the geographical center of the Gerber Block and has a moderately high priority "I" ranking. It permitted season of use is mid-spring to mid-summer and is grazed as a 5 pasture, rest-rotation grazing system where at least one pasture is fully rested each year. The five pastures are widely variable in size and production and two (Midway and Dog Hollow) have small portions devoted as artificially seeded/irrigated "water spreaders". These areas have the potential when irrigated, to produce several times what the native range would otherwise produce and produce it much later in the season. Because of this, the Dog Hollow pasture is the last scheduled pasture in the rotation (i.e. mid to late July). This allotment was in non-use for some years during the late 1980's into the mid 1990's, at which point the allotment resumed regular use, though at less than the half the permitted use levels; a grazing level that has continued to date. However, full grazing use could occur at any point.

The KFRA ROD/RMP listed four specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #2, #6, #7, & #8 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had an ample amount of monitoring data collected on it over the past 25 years, including various trend and condition information, utilization, and riparian photo points. All this survey/monitoring information indicates that the current grazing management continues to be appropriate (more fully covered in Step 5). Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Pitchlog Allotment (0887)

The Pitchlog allotment is located in the northeastern quarter of the Gerber Block and is one of the larger and most important grazing allotments in the KFRA. As such, it is also one of the highest priority "I" category allotments. It does include some private lands along the extreme eastern edge, most of which are owned by the grazing permittee. The season of use is mid-spring to early summer. Pitchlog is one of the three allotments that have been under formal section 7 (Endangered Species Act) consultation since 1994, due to the presence of the endangered shortnose suckers in Gerber Reservoir and its tributaries - particularly Barnes Valley Creek. The allotment is permitted as a 4 pasture, "flash" (high intensity, short-duration) rest-rotation grazing system where one major pasture is fully rested each year for plant health/vigor purposes. In addition, the two important riparian areas - Barnes Valley and Pitchlog Creeks - are both within the NE pasture, though with the exception of one exclosure on Pitchlog Creek, they are not fenced separate from the surrounding uplands. The NE pasture is an equal use unit in the grazing rotation system and in years that it is grazed (3 out of 4 years for 16 days) it is always the first pasture (mid to late May). This is done so for several reasons: the creeks are at a relatively high water level discouraging cattle use; the upland vegetation is as green and attractive as the riparian areas; and it allows ample time for substantial riparian regrowth after the cattle are removed.

The KFRA ROD/RMP listed seven specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1- #3 and #5- #9 off the previously itemized list. This allotment has had fairly extensive amounts of rangeland monitoring studies established and read on it over the past 27 years; and in particular, during the past 8 years due to the section 7 consultation requirements. These include various condition and trend studies, utilization, a mix of riparian related studies, in addition to the ESI survey. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999. That assessment and the section 7 consultations, have affirmed that the current grazing management continues to be appropriate (see also Step 5).

Rock Creek Allotment (0888)

The Rock Creek allotment is located in the extreme southeast corner of the Gerber Block and although it is a "C" category allotment, it is a relatively important one due to size and location. It has a mid to late spring season of use and is grazed as one big pasture having no internal division fencing. This allotment also contains a substantial amount of intermingled private lands that are used in common with the BLM, and are owned by various entities including the permittee. Grazing on the allotment is done under the Rock Creek Grazing Plan (a defacto CRMP), originally completed in 1983 in cooperation with the neighboring Fremont and Modoc National Forests. This CRMP has historically allowed the allotment some periodic rest, although during most of the 1990's the allotment was used yearly due to wildfire-related deferment of some of the adjacent USFS lands. The CRMP was recently revised by the USFS and includes the restoration of periodic rest. The allotment was rested in 2002.

The KFRA ROD/RMP listed three specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #2, #6, & #7 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had some monitoring data collected on it over the past 25 years, including various trend and condition information, utilization, and riparian photo points. All this survey/monitoring information indicates that the current grazing management was and continues to be appropriate (covered in Step 5). Note: This watershed analysis will serve as the *Rangeland Health Standards Assessment* for this allotment.

Timber Hill Allotment (0889)

Timber Hill is a mid-summer grazing use allotment located in the southeastern portion of the Gerber Block. It is a moderately high priority "I" category allotment that also has a significant amount of unfenced, privately owned, lands intermingled with the BLM administered lands. It has a limited (5-6 weeks) season of use that does not start until after the herbaceous vegetation has completed most or all of its growth requirements. Though not fenced into separate pastures, the allotment is run on a quasi-deferred rotation system, in that permittee begins the cattle use on opposite ends of the allotment in an alternating sequence; i.e. start on the north one year, south the next. Timber Hill has little if any riparian on BLM administered lands.

The KFRA ROD/RMP listed three specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1, #2 & #6 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had monitoring data collected on it over the past 25 years, including trend and condition information, and utilization. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999 and found that the overall current grazing use was appropriate (covered in Step 5).

Willow Valley Allotment (0890)

This mid-spring to early summer grazing use allotment is located in the southern and southwestern portions of the Gerber Block. It is a one of the highest priority "I" category allotments in the KFRA and second only in size to the Horsefly allotment. There is very limited private lands intermingled with the BLM in this allotment. The north half of the Woolen Canyon pasture is actually out of the watershed analysis area, though it must be considered as a whole for continuity of grazing analysis. The Willow Valley allotment is permitted as a 4 pasture, rest-rotation grazing system which has been variably followed through the years for a variety of reasons. It has numerous scattered upland areas, primarily in the Woolen Canyon and Chaining pastures, with long term condition problems which emanate from the pre-Taylor Grazing Act, uncontrolled grazing era, as noted in the introduction to this section. Then in 1937, a catastrophic fire burned through much of this area, which in conjunction with the still relatively high grazing levels in the years after burning, caused the problem areas that are still obvious today. It is unknown whether these areas, which are now dominated by annual weeds and grasses, have the potential to improve significantly regardless of the level of grazing use.

Antelope Creek, which flows through the middle of the allotment to end at Willow Valley Reservoir, has been largely fenced separately in the Duncan Springs exclosure. This area has perennial water from several spring sources and has dramatically improved in condition since fencing in the late 1980's. A smaller portion of the drainage, above the CCC or Alkali Spring road, still has uninhibited livestock access and some riparian condition issues. The two eastern pastures - Antelope and Notch Corral - are both in generally good vegetative conditions with few of the problems noted above in the two western pastures.

The KFRA ROD/RMP listed seven specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment - #1, #2, and #4 through #8 off the previously itemized list. In addition to the recent ESI survey information, this allotment has had extensive amounts of monitoring data collected on it over the past 33 years - as long as studies have been collected in the resource area. These include various trend and condition studies, a mix of riparian studies, several types of utilization, and others. The *Rangeland Health Standards Assessment* for this allotment was completed in late 2000 and found that the recent grazing management, though within the sustained yield capacity of the majority of the allotment, may still not be appropriate for improving the poorer condition areas (covered in Step 5). The Assessment made numerous recommendations which are being implemented already and are summarized in Step 6. Because of the long-term condition problems and its size, the Willow Valley allotment is probably the KFRA's most challenging resource problem area related to livestock grazing.

William's Allotment (0892)

The William's allotment is located north of Lorella, in the extreme northwestern BLM portion of the analysis area. It is a spring use, medium low priority "M" category allotment, which is included as a minor component of the Yainax Butte Coordinated Resource Management Plan (CRMP) area. This 118,000 acre CRMP area is 70% U.S. Forest Service lands with large blocks of intermingled private lands (21%) and a relatively small amount (6%) of BLM administered lands, of which an even smaller part is in this analysis area. The Yainax Butte CRMP is a cooperative planning effort that guides the management efforts on these lands, regardless of ownership. Grazing use of the area was the primary driving force in the initiation of the CRMP about 20 years ago. The plan was extensively revised in the early 1990's.

The KFRA ROD/RMP did not identify any specific "Identified Resources Conflicts/Concerns" related to the livestock grazing on this allotment. Due to the low priority of the allotment, typical rangeland monitoring studies have not been established/read on this allotment. However, during the fall of 2002, ESI was completed. The *Rangeland Health Standards Assessment* for William's is scheduled for 2003 and not as part of this document, though this analysis will assist in the preparation of the Assessment when done.

USFS Administered Lands

Fremont National Forest - There are nine Forest Service allotments lying adjacent to the "Gerber Block" on the west, north, and east sides. Seven of these allotments are administered by the Bly ranger district and 2 by the Lakeview ranger district. The following table identifies the allotments. The first seven are on the Bly district and the remaining 2 are on Lakeview. The Dent Creek allotment is not included in this table due to the insignificant amount of acreage within the watershed and it corresponding capacity.

Table 3-50. Fremont National Forest Allotments/Authorized Use

Allotment	Permitted Numbers	Season of Use
Arkansas	152 pair Term Permit, 21 pair Term on/off Permit	6/1 – 9/30
Barnes Valley	517 pair Term Permit, 33 pair Term private land Permit	6/16 – 7/14
Bly Ridge	Vacant	
Horsefly	402 pair Term Permit, 148 pair Term private land Permit	7/7 – 9/30
Privy Springs	11 pair Term on/off Permit	6/16 – 7/15
Pitchlog	47 pair Term Permit, 5 pair Term private land Permit	7/1 – 9/30
Yainax Butte	375 pair Term Permit, 612 Term on-off Permit, 9 pair Term private land Permit 2 months	5/15 – 9/30
Fort Spring	350 pair Term Permit	6/16 – 7/15
Wildhorse	412 pair Term Permit	6/1 – 9/30

The following are some brief narratives on the allotments describing more specific aspects of their management:

Arkansas Allotment

This allotment lies on the Bly district east of the Gerber Block with the watershed boundary being this allotment's eastern boundary. This allotment is grazed under 2 pasture rest rotation system by cows with big calves. The calves are separated from the cows about half way through the season and the cows stay on the allotment through the end of the season.

Barnes Valley Allotment

This allotment lies on the Bly district east of the Gerber Block and it is estimated almost half of the allotment is within the watershed boundary. This allotment is grazed for approximately a month at the first part of the season then the cattle are moved to the Horsefly allotment.

Bly Ridge Allotment

This allotment lies on the Bly district north of the Gerber Block with about 1/3 of the allotment within the watershed boundary. This allotment has been vacant since 1995 and was grazed under a temporary permit for 80 or 100 pair, issued yearly, from 1989 to 1994. In 1995 the district ranger decided not to issue the temporary permit pending the completion of environmental analysis for grazing. As of yet this analysis has not been done.

Horsefly Allotment

This allotment lies on the Bly district just north of the Gerber Block with over half in the watershed boundary. This allotment is grazed under a 4 pasture deferred system.

Privy Springs Allotment

This small allotment lies on the Bly district north of the Gerber Block and is grazed for one month.

Pitchlog Allotment

This allotment lies on the Bly district east of and adjacent to the Gerber Block. Cattle come on to this allotment from the BLM Pitchlog allotment. This allotment contains a riparian pasture along Barnes Valley Creek and an upland pasture containing Pitchlog Creek. This allotment has been grazed under a 2 pasture deferred system.

Yainax Butte Allotment

This allotment lies on the Bly district north and west of and is adjacent to the Gerber Block. This is the largest allotment containing 11 pastures, with 8 being totally or partially within the watershed boundary. This allotment is grazed under an 8 pasture deferred rotation system.

Fort Springs Allotment

This allotment lies southeast of the Gerber Block on the Lakeview district. This allotment is part of a coordinated grazing plan with the BLM KFRA, Fremont and Modoc National Forest. This allotment has one pasture with early season use.

Wildhorse Allotment

This allotment lies south and east of the Gerber Block on the Lakeview district. This allotment is grazed under a 3 pasture deferred system with incidental use allowed on a 4th pasture. The Bear Valley pasture was converted from an allotment to a pasture in 1999. This pasture was a sheep allotment up until 1992 when the permit was cancelled due to violation of terms of the permit.

Desired Future Condition Desired Future Condition

The desired future condition, as stated in the Fremont National Forest Land and Resource Management Plan, (1989) page 119, is "Permitted livestock grazing on the Forest will remain at current levels. Range improvements will increase in an attempt to manage cattle grazing more effectively, especially in riparian areas. Change on the range will result in using livestock as management tools to manipulate vegetation and enhance other resources such as, increased palatability of forage for wildlife, plantation release, and noxious weed control.

Modoc National Forest

The following information was provided by Brad Reed, Resource Officer for the Doublehead Ranger District, Modoc National Forest, and is pertinent to those portions of the watershed that lie south of the Oregon/California border:

There are two grazing allotments with one permit on each. The Clear Lake allotment is currently permitted for 750 head (cows/calf pairs), 4/16-10/15. The Modoc is beginning to implement a management system that would allow 805 head as follows:

Falvey Unit, Clear Lake Allotment	270 hd.	4/16-10/15
Stateline Unit, Clear Lake Allotment	135 hd.	5/01-10/15
Rimrock Unit, Clear Lake Allotment	400 hd.	5/16-10/15

The Falvey Unit consists of three pastures on the west side of the allotment (partially within the watershed). The Stateline Unit consists of two pastures north of Lost River/Rock Creek (entirely within the watershed). The Rimrock Unit consists of four pastures on the east side of the allotment (partially within the watershed). This new grazing management system will be in completely in place by 2002.

The Warm Springs allotment is included within the Rock Creek Grazing Plan, noted in the BLM's Rock Creek allotment previously. It is a coordinated plan that also includes the Fremont and Modoc National Forests. Within the Warm Springs allotment, 350 cattle are permitted with the grazing season varying by year depending on the grazing plan, though it generally amounts to approximately 1300 head months beginning 5/1 and ending 10/15.

Recreation

Recreation use in the area was extremely limited until the development of logging roads and vehicles that could travel on these primitive roads became available, sometime in the early part of the 20th century. Recreation use in the area remained limited, but started to increase after WW II, with the advent of more rugged off-highway vehicles. As road conditions improved and disposable incomes increased, more people used the area for camping, fishing and hunting trips. Gerber campground and the nearby primitive campsites were originally developed in the 1960s by the BLM. Recreation use has remained fairly steady over the past decade, with an estimated 15,000 visitor use days annually in the Gerber area.

Recreation activities at Gerber campground are primarily fishing, camping, hunting and general sight seeing/ wildlife viewing. Fishing remains the most popular day use activity, along with picnicking. Visitor use numbers for the campground are generally low to moderate, with weekends and holidays during the summer months exhibiting the greatest demand. Use numbers are also reflected in reservoir levels and fishing success. Higher reservoir levels and greater fishing success consistently bring in greater numbers of visitors. Dispersed camping areas are most frequently used during weekends during summer months, and during the hunting season in the fall.

The primary developed recreation facilities are located at Gerber south and north campgrounds, which provide potable water and an RV dump station and charge fees for day use or overnight camping. Several outlying campsites (hunter camps) are available for free. The BLM and Forest Service both allow dispersed camping in the Gerber area, however during the summer fire season camp fires are limited to designated campsites. The USFS has no developed facilities in the watershed. Camping is limited to 14 days at one time at one campsite.

Cultural Resources

Archaeology

The Gerber/Willow Valley area is rich in both prehistoric and historic cultural resources. A "cultural resource" is defined as objects, sites and information of historic, prehistoric, archaeological, architectural, paleontological or traditional significance. The term includes places of cultural or religious importance and artifacts associated with them.

Archaeological evidence clearly confirms that humans have occupied the region at least ca. 12,000 years (O'Neill et al. 2001:13). At the time of Euro-American contact, the area was occupied by the Modoc Indians. Today remnants of prehistoric use of the area abound, appearing in the form of rock features (i.e. rock rings, rock alignments, bedrock mortars, rock cairns), rock art, and lithic scatters. To date only one extensive archaeological excavation has been conducted within the boundaries of the watershed. That excavation was conducted in 1986 by the University of Oregon at the Peninsula Site (35KL87) located in the Gerber Reservoir region. Excavated materials suggested a seasonal occupation of the site where plant and animal food processing took place. The age of the site extends back to 4000 BP (Silvermoon 1994).

Historically, ranching, logging, and the Civilian Conservation Corps (CCC) have left their marks in the form of can dumps, fences, roads, reservoirs, and wooden structures. For example, the CCC built a telephone line along Willow Valley Road (also known as Stateline) that is still standing (Figure 3-11 and 3-12).

Figure 3-11. Photo of telephone pole built along Willow Valley Road. (Photo by Robert Mutch, 2002.)

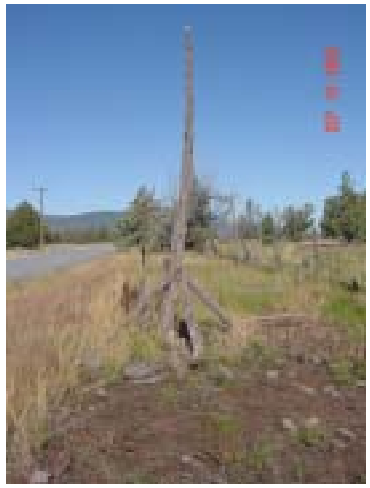


Figure 3-12. Historic photo of Antelope telephone line built by CCC Co. 557. (Photo by CCC.)

To date, the BLM has surveyed 51% of BLM managed lands, the Fremont NF has surveyed 36% of their lands, and the Modoc NF has surveyed 24% of their lands (Map 3.5, Appendix E). Via these inventories, the BLM has formally recorded approximately 404 prehistoric sites, approximately 54 historic sites, and approximately 17 multi-component sites on public land. The Fremont National Forest has recorded approximately 148 prehistoric sites, approximately 35 historic sites, and no multi-component sites. The Modoc National Forest has recorded approximately 181 prehistoric sites, no historic sites, and approximately 4 multi-component sites. (Refer to Appendix B, List of Inventoried Cultural Sites and Appendix E, Map 3.5 - Surveyed Area within the Watershed.)

Traditional Cultural Context

Traditional cultural properties are defined as a property associated with cultural practices or beliefs of a living community that are rooted in that communities' history and are a part of that communities' cultural identity (Parker, 1998). Evidence of traditional use by Native Americans in the Gerber/Willow Valley watershed extends back for thousands of years before the arrival of Euro-Americans. Although documentation of current use is limited, members of the Klamath Tribes consider the area to be important for hunting, fishing, gathering plant resources, and spiritual activities. According to Gerald Skelton, Klamath Tribes Culture and Heritage Director:

"The Horsefly (Gerber)/Willow Valley area is culturally significant to the Klamath Tribes. In addition to the Tribes oral history, the number of tribal cultural sites located in the area provides tangible (archaeological) evidence that easily proves it is a significant area. The intangible value of the area is great in that it is still an area used by tribal families for prayer, vision quests, and spiritual guidance.

In addition, the Horsefly (Gerber)/Willow Valley area continues to be an important area for the fisheries (my Grandfather caught a land-locked salmon there in the late 70s early 80s) as well as an important area for hunting and gathering. The area is also a migration corridor for the mule deer. There is also a significant number of antelope in the area as well. The Horsefly (Gerber)/Willow valley area continues to provide, directly and indirectly, significant resources to The Tribes in the form of fisheries, wildlife/fowl, plant, and other forms such as but not limited to mineral resources". (Skelton, personal communication, 2003)

Cultural Plants and Subsistence Hunting and Fishing

Members of the Klamath Tribes continue to harvest plants (i.e. epos) and big game from the Gerber/Willow Valley watershed area. Twice, within the past five years, KFRA archaeologists have fulfilled requests to personally escort a group of Klamath Tribal elders to epos digging areas around Willow Valley Reservoir. Native plant resources are in good condition within the watershed boundaries. Hunting and fishing continue to be an important part of the Tribal diet, especially mule deer along the northern boundary of the watershed. Managing to maintain mule deer habitat and populations is important to preserving this integral part of the Klamath Tribes' culture.

Administrative Facilities

The Gerber reservoir area has several permanent facilities related to the construction of Gerber Dam. The USBR (Bureau of Reclamation) house, located next to the south Gerber campground, is maintained by the BLM for use as a recreation administrative site. The house is historically significant, having been built as a residence for the Bureau of Reclamation's dam keeper/attendant.

The BLM has several facilities used by the fire program, including a guard station, crew bunk house, several work shops and outbuildings. In addition support facilities including several domestic water wells and pump houses are scattered between the Gerber campground areas.

STEP 4. REFERENCE CONDITIONS

The purpose of Step 4 is to describe ecological conditions prior to change over time as a result of human influence and natural disturbance. Such conditions are termed “reference” conditions. Establishing reference conditions allows the comparison between reference and current conditions to be presented in Step 5 “Synthesis and Interpretation”. The Reference Conditions step is presented with the premise that ecosystems adapted over extended time periods and that the greatest probability for maintaining future sustainability will require management practices which mimic or borrow from natural components, processes and structures.

I. Watershed and Aquatics

Uplands/Soils

Since 1899, the climatic events that drive erosion and plant growth have been part of soil surveys in the United States. Erosion rates on a landscape basis vary with ecological site conditions that are identified in soil and vegetation survey for Gerber’s catchment. The survey provides descriptions of reference species composition for rangelands and understory forest vegetation that provide effective ground cover (Soil Survey Staff, 2002). Similarly, bank erosion conditions are identified by ecological status (condition) of the riparian ecological types (sites) (Riegel et al., 2002). In the Gerber catchment, most upland range sites are currently in late condition, which implies direct similarity to reference conditions, and most forest sites are in the lower mid condition, which implies more deviation from reference conditions (Soil Survey Staff, 2002). The discussion in this section will concentrate on the latter.

Local ecological site inventory data (Soil Survey Staff, 2002) was used to locate sites on a condition gradient in the Pine - Fescue sites for a comparison of infiltration rate and ground cover. Prior to the infiltration test surface soils were pre-wet with a liter for comparable among site moisture. Water flow into a soil was regulated with a Constant Head Permeameter set at 10 cm of suction (Amoozegar, A. 1992). For each test, 400 ml of water was applied in an auger holes (25 cm deep by 5 cm wide). Mean infiltration rate in milliliters per seconds is based on 12 tests run at a site. Ground cover (hits) were sampled at each meter along a 20 meter transect. Litter in the early-mid condition sites was mostly un-decomposed pine needles, while the litter in the late condition site is a dark and decaying mix of needle and leaf matter. There was scattered grass cover in the early-mid sites, but the cover was insufficient to form grassy mats, which register as vegetation hits. A positive correlation between grassy cover and infiltration rate in Pine Fescue sites was also found and is shown in Table 4-1.

Table 4-1: Comparison of percent ground cover and mean infiltration rate (ml/second)

		Condition Classes		
	Early*	Early-Mid**	Mid**	Late**
Bare (%)	100	15	1	13
Litter (%)	—	85	91	70
Vegetation (%)	—	—	6	16
Infiltration (ml/s)	6.4	7.7	7.9	8.2

*High intensity burn site

**A condition gradient from early mid to late seral in Pine Fescue ecological sites is shown. (Most vegetation hits are grass plants.)

Recent sampling along transects within forest vegetation show soil tilth, indicated by soft granular texture, is better developed in forest openings where grassy vegetation such as Ross sedge and or Idaho fescue occurred. At mid condition, the understory forest vegetation is poorly developed, except in forest openings. And nitrogen-fixing plants, such as squawcarpet (*Ceanothus* sp.) and lupine were spotty. With incomplete understory plants the sites face a risk of humus decline, which is an erosion risk to the "life in the soil." Humus and microbial functional decline is an issue for forest growth. In eastside pine Busse et al. (1996) shows understory vegetation growth drives the humus and the nutrient processes for sustained forest overstory growth. And the better soil tilth observed with forest grass and sedge shows there is an opportunity to improve the soil life.

In summary, the reference forest in Gerber was a grassy landscape with large well-spaced pines with sufficient understory to sustain the soil, a balanced forest overstory and understory (Soil Survey Staff, 2002). In reference (or late seral) conditions, effective groundcover would have provided proper soil tilth and optimal infiltration. Under these conditions, with mild Pacific storm intensities and gentle topography, soil erosion was apt to be minimal. The frequent, low intensity fires that would have maintained this open forest would not likely produce the post fire hydrophobicity (resistance to water infiltration) associated with high intensity crown fires. Soil compaction, which primarily results from the use of heavy machinery, would not have been an issue.

Hydrology

(The format of the following section is based on watershed processes rather than land management issues.)

Watershed Processes

Precipitation in the watershed provided recharge to local, intermediate and regional groundwater systems. The recharge occurring in the uplands generates groundwater flow to ephemeral lakes and wetlands and base flow to surface water systems. During precipitation events, rainfall that does not infiltrate into the soil will flow out of the basin as runoff. Lowering the infiltration rate of a soil can increase the amount of runoff generated, thereby increasing the frequency and magnitude of flooding events. In addition, the runoff will leave the local system as surface water flow, decreasing the available amount of water to the local system after the precipitation event.

Infiltration

Prior to Euro-American settlement, plant communities were generally at least late serial stage, which suggests dominance by perennial grasses in the rangelands. The presence of perennial grasses in the rangelands would have increased infiltration as discussed in the Chapter 4 Soils section. In addition, the presence of sufficient organic litter would have minimized the impacts of sediment mobilization due to raindrop impact.

As discussed in the Chapter 4 Vegetation section, uncontrolled, heavy grazing that occurred during the first 50-60 years of Euro-American settlement caused profound changes in the vegetation communities. Grasses were heavily grazed; suppressing vigor and giving competitive advantage to the less grazed or non-grazed plants (more woody species such as sagebrush and juniper). These changes in plant communities from grasses to shrubs decreased the infiltration rate of the soil by decreasing the fine root mass.

During the past 70 years vegetation conditions have been trending upward with improved grazing management. Many areas have returned to PNC or late seral stage vegetation communities. This improvement in vegetation community would increase the infiltration rate of the soils. It is unlikely that the infiltration rate of these soils has returned to pre-settlement conditions; however the vegetation communities are in an upward trend.

In addition, prior to Euro-American settlement in the Gerber watershed, the vegetation was adapted to frequent and low intensity fires. The forests were uniformly spaced stands of trees with openings ranging from ¼ to 40 acres at irregular intervals across the stands. This open forest structure had an understory component of grasses and shrubs. This groundcover vegetation increased the infiltration rate of the soils in the forest.

Frequent fire in the rangelands prevented the encroachment of juniper into meadows and rangelands. Juniper out-competes shrubs and grasses for sunlight and nutrients; therefore an increase in juniper vegetation is followed by a decrease in both shrubs and grasses. The presence of juniper decreases infiltration and decreases overland flow (Rick Miller, personal communication, 2002). Therefore, prior to Euro-American settlement large portions of the analysis area would have had increased infiltration rates and decreased overland flow than currently exists.

Evapotranspiration

A number of areas within the Gerber watershed that are now reservoirs historically functioned as wetlands. Wetlands generally have high evaporation rates. However, evaporation rates from wetland areas are lower than evaporation rates from the open lakes created by reservoir development in the watershed. In addition, the historic structure of open forests in the Gerber watershed would have had a lower rate of evapotranspiration than the current, overstocked stands. Rangelands were vegetated by shrubs and grasses rather than juniper. Historically, the vegetation in the rangelands would not have transpired during the winter months, as juniper does currently (Bedell, et al, 1993). Therefore, the amount of water loss to the atmosphere was lower historically than at present.

Runoff

The presence of openings in the forest canopy increases the snow catch in those openings (Troendle, 1982). In openings of 3 acres and less, there is significant shading to delay the timing of snowpack melt (Baker, 1988). In larger canopy openings there is an increased amount of solar radiation that can cause earlier snowpack melt to occur (Baker, 1988). Historic canopy openings of ¼ to 40 acres were present in the forested areas of the Gerber watershed. The snowmelt from these openings would have influenced the timing of peak flows in the watershed as well as the amount of late season base flow in the streams.

Streamflows

The role of shallow aquifers in storing and releasing water was likely much greater prior to Euro-American settlement. Wetlands, valley floor and hillslope wet meadows, and floodplains would have been inundated on a fairly regular basis (on the order of once a year) for varying lengths of time. The vegetation communities and soils in these areas would slow the water and allow it to infiltrate over time. Water that was recharged into these aquifers would either move out of the analysis area through groundwater flow paths or, more likely, would have followed hydraulic gradients through the soil subsurface and gradually emerged downstream as seeps. The general effect of such processes would have been to decrease flood peaks and increase the volume and persistence of summer low flows. The past extent of these shallow aquifers is unknown, although they would have been most likely to occupy alluvial valley bottoms (such as occur in Casebeer, Ben Hall, Pitch Log, and numerous other creeks in the analysis area).

<u>Spring fed streams</u> - Many stream segments in the analysis area receive substantial inputs from springs and seeps that occur within, adjacent to, or in close proximity to streams or wetlands. The relative effect of these inputs is largest in small catchments that do not have drainage area substantial enough to otherwise supply flow except for short-lived periods during snowmelt or storm runoff events. Streams in these catchments (which include Casebeer and Barnes Creeks; the drainages heading at O' Shea, J, Wagon Road, and the Pankey Springs; and numerous other small catchments) likely had well developed Rosgen-E channels, stable geomorphology, abundant riparian vegetation, and high water quality. Streamflow likely persisted year-round, although seasonal and annual variation would be expected as a function of evapotranspiration rates and precipitation inputs. This variability was probably highest in springs that had relatively low discharge rates, as these springs are, in general, recharged from shallow local groundwater systems (controlled

primarily by topography) rather than deep intermediate or regional groundwater systems (controlled primarily by lithologic contacts).

Headwater and trunk streams - Numerous streams in the analysis area, such as Barnes Valley, Long Branch, Pitch Log, Ben Hall, or Rock Creek, drain moderate-sized watersheds. Streamflow in these systems was driven by interactions between storm and snowmelt runoff, springs, and baseflow release from wetlands and alluvial aquifers. Runoff from uplands was likely somewhat high in some areas, as a result of low organic matter content in clay-rich soils. Overland flow generated on hillslopes was routed into streams in one of two ways: as stormflow which contributed to peak flows, or as throughflow which entered into shallow groundwater systems and was slowly released.

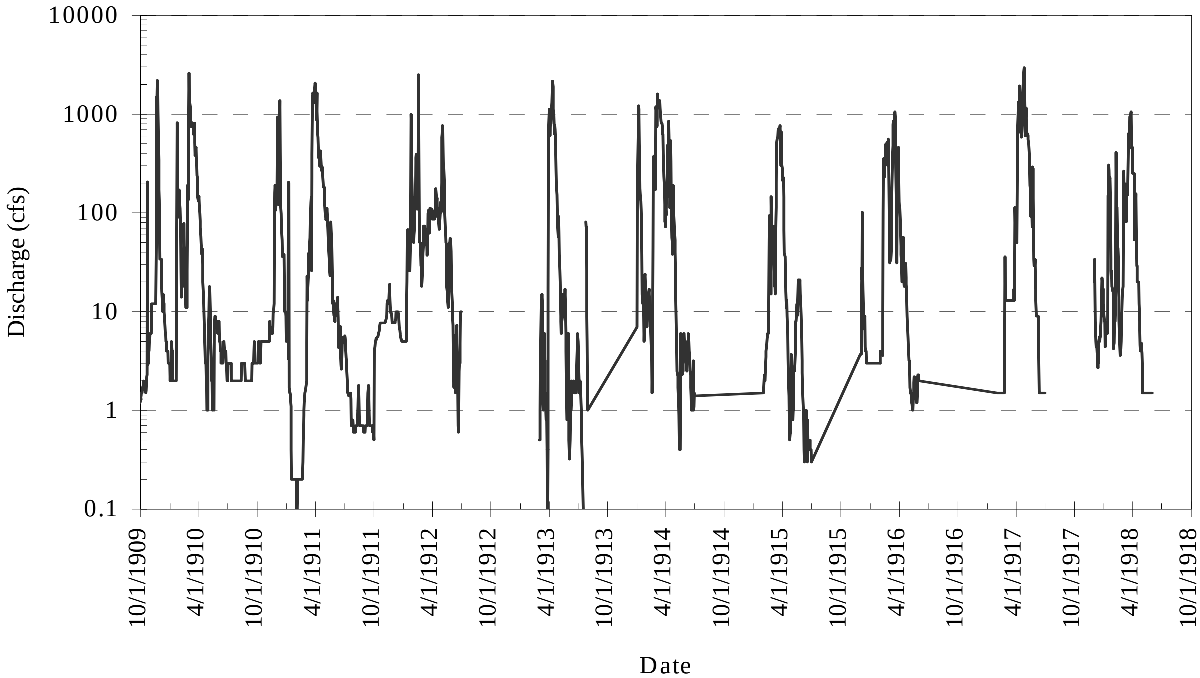
Large meadow areas adjacent to some streams (such as Ben Hall and Barnes Valley Creeks) likely used a large volume of water through evapotranspiration, thereby reducing baseflows from late spring through autumn. General Land Office survey notes from late summer of 1868 indicate that flow in Barnes Valley Creek near the upstream limit of BLM ownership was perennial, but spatially interrupted (i.e., water was found only in pools).

Large streams - Large streams in the analysis area, such as Miller Creek, the East Branch of the Lost River, and the Upper Lost River, would be expected to have different hydrologic regimes than streams draining smaller areas. The upstream presence of wetlands and wet meadows would tend to attenuate annual hydrographs, while the sheer size of contributing drainage areas would favor the occasional occurrence of large floods.

Miller Creek had low summer streamflows prior to development of Gerber Reservoir, and perennial flows may have been “spatially interrupted” during the summer months (it appears that flow measurements did not occur during the summer in some years). Depending on the type of water year, flows became quite low (approximately 1 cfs) sometime between April and July and did not resume until November or December (Figure 4-1). The late onset of flows in early winter suggests the extent of water storage capacity available in wetlands and uplands. Large floods were recorded in 1907, and inferred for 1867. Estimations made using recent Gerber Reservoir inflow data also indicate that large peak flows would occur in Miller Creek were it not for Gerber Dam. Watershed characteristics and the nature of runoff-generating processes caused the onset and recession of high flows to occur rapidly.

Flows from Duncan Springs may have sustained the East Branch of the Lost River, although it is possible that much of this water was absorbed by valley floor soils or utilized by vegetation. In any case, summer flows would have been much lower than the present irrigation releases, and peak flows likely would have been higher.

Figure 4-1. Discharge data for Miller Creek near Lorella, from water years 1910 to 1912.



(Note logarithmic scale. Data from USBR Klamath Basin Area Office, unavailable for 10/1/1912 and 10/1/1917.)
(Note that homesteading had begun by this period and hydrologic and channel alterations had likely occurred.)

Stream Channels

Channel Shape and Bank Stability
Few stream channels in the analysis area are in “reference condition.” Using assumptions about landscape processes that would have occurred prior to the historic period, and historical maps and documentation, it is possible to describe the general form that streams would have taken prior to European settlement. While these descriptions provide context for understanding landscape history, they also provide an idea of important channel features and processes, thereby providing a target for private and public land managers to aim for as they conduct resource management activities across the landscape.

Historically, a mix of Rosgen B, C, and E stream types occurred in the analysis area. B stream types would have occurred were they occur now, although the extent of these stream types may have been slightly lower than at present. Rosgen C and E stream types were likely much more abundant historically than at present. These streams would have occupied low gradient unconfined valleys and wet meadow areas. Rosgen F stream types, which are widespread currently, would have occurred rarely prior to European settlement.

Rosgen C and E stream types are characterized as having high sinuosity, low width-depth ratios, and a high degree of channel-floodplain connectivity. As discussed below in the subsection – *Wetland and Riparian Conditions*, it is likely that deeply-rooted perennial grasses and shrub thickets provided more bank stability than at present. Due to the presence of stable banks and functioning floodplains, stream channels would have been more resilient during flood events. Although some channel adjustment would inevitably occur during floods, streams would have been more likely to transport floods while maintaining channel dimensions, plan-form patterns, and longitudinal profiles. As a result, stream channels would have been more narrow, and have more and deeper pools, as well as more abundant overhanging banks. Over time, as streams migrated across floodplains, off-channel features such as oxbows and isolated pools would have formed.

The total length of the stream network may have been lower historically than at present. Gullies and small ephemeral channels draining upland areas were likely less common than they are currently. Conversely, more miles of larger streams would have occupied low-lying areas that are currently inundated by reservoirs (primarily Gerber and Willow Valley) (Table 4-2). The character of the inundated streams was likely a mix of E or C stream types in unconfined areas (such as near the Gerber Homesite) and B stream types in confined areas (such as the area near Gerber Dam).

Table 4-2. Approximate length of streams inundated by Gerber Reservoir.

Stream System	Estimated inundated length* (miles)
Barnes Valley	4.9
Casebeer	0.3
Barnes	2.0
Ben Hall	2.3
Unnamed tributary (Round Valley)	1.2

*Estimated based on 1967 USBR "Gerber Reservoir Topography" map. These values are likely underestimates, since meanders are not adequately represented at the 1:36000 map scale.

Bed Material

It is not possible to describe specific reference conditions for bed material characteristics in the analysis area. Given that the magnitude of erosion and runoff from uplands was lower than at present, as were bank erosion rates, it can be assumed that the proportion of fine sediments (silt and sand) in stream beds would have been much lower than at present. Rather than settling out in the stream bed as peak flows receded, fine sediments would have been filtered out as streams flowed through meadow areas or as peak flows inundated floodplain areas.

Historically, bed materials in Rosgen B and C channels would have likely been composed primarily of sand, gravel, and cobbles. Lower gradient E channels would have had a higher proportion of sand and a lower proportion of cobbles. Boulders would have occurred in stream channels, but their occurrence would have been lower than at present. Reduced abundance of fine sediments would have been resulted in "cleaner" gravels on riffles and the lower portion of point bars. Fines would have accumulated primarily on the upper portion of point bars and on floodplains.

Stream reaches that currently have on-stream dams located upstream may have had higher rates of bedload input in the past, depending on upstream landforms. For instance, the supply of sand and gravel to Miller Creek may have been higher, since the streams inundated by Gerber Reservoir appear to have had sufficient gradient to transport bed material.

In-Stream Large Wood Recruitment and Retention

The rate at which LWD historically entered streams is likely different than at present, although the magnitude and net effect of this difference varies with stream type, valley form, and ecological type.

For E type streams (currently C, E, and F streams), LWD delivery to streams was likely infrequent. These streams flowed across unconfined valleys or meadows that supported few conifers and bank erosion rates were lower than at present. As a result, fewer trees were available and the processes responsible for delivering trees to streams were not as active as at present. That said, some LWD was delivered to these streams from riparian hardwood stands or adjacent hillslopes.

In B and C type streams that flowed near or adjacent to forested hillslopes, the rate at which large LWD was delivered was likely similar to or higher than at present. As discussed in the *Forested Upland* section, large trees were more common than at present. In general, frequent underburns and the general lack of large-scale mortality would have caused trees to be delivered to riparian areas steadily over time (rather than during intense but infrequent episodes). In areas affected by patches of high severity fire or rare stand replacement fires, short-lived episodes of high LWD delivery rates may have occurred, followed by periods during which delivery rates were diminished.

Large pines, upon being delivered to riparian areas and stream channels, would have tended to persist over fairly long time periods (decades) due to moist conditions that would lessen the impacts of frequent fires. White fir, which would have been less abundant, is less resistant to decay and would have lasted for shorter periods. The size and species composition of instream LWD would have caused individual pieces to be fairly stable once they reached streams. Large pieces would have been key structural elements of jams formed as smaller pieces were transported downstream.

These jams, along with higher levels of beaver activity, would have created pools and backwater areas. These low gradient areas would have forced water onto floodplains and into shallow aquifer systems. In addition, they would have reduced stream energy causing sediment to accumulate. Beaver activity was likely highest in low gradient valleys that had perennial streamflow, deep soil, and abundant riparian shrubs and deciduous trees.

Riparian Vegetation

Wetland and Riparian Condition

In order to estimate the wetland/riparian conditions in the watershed in "reference conditions", an understanding of natural disturbance processes is necessary. A classic landform reference for floodplain riparian habitats in fairly large watersheds is *Fluvial Process in Geomorphology* (Leopold et al, 1964). This landform reference provides theory and examples of hill-slope, floodplain, and stream land patterns shaped by water flow. For example, stream riffles and associated gravel bars occur at 5 to 7 channel widths along a stream, and the radius of the gravel bar is 2 to 3 channel widths long, so on average a gravel bar occurs at 6 channel widths with 2 to 3 width new bars along the channel bank (Leopold et al., 1964). Along the whole 12 channel widths of a stream meander length, riparian habitats are apt to be composed of an even mix of low status habitats on the new gravel bar deposits, mid status habitats on the older upper bar(s) and high status habitats on floodplain and cut banks.

In comparison, findings from a wide range of upper watershed riparian habitats in Nevada and California were almost evenly mixed between low, moderate and high ecological status (Weixelman et al, 1996). The distribution of cold willow habitats was 24 percent low, 64 percent moderate and 11 percent high ecological status (Weixelman et al., 1996, 1999). Along wet stringer meadows, *Carex nebrascensis* habitat distribution was of 16 percent low, 68 percent moderate and 16 percent high (Weixelman et al., 1996). So in both cold willow and wet meadow habitats, the distribution found was close to a normal distribution. A normal distribution has 67 percent in the central group and 16 percent in each tail (Mendenhall et al 1990).

Leopold et al. (1964) characterized floodplains in the lower watershed, while Weixelman et al. (1996) characterized floodplains and habitats in the upper watershed. Similarly, the National Riparian Service Team asserts proper function condition of riparian habitats occurs in a mid seral stage and moderate status (Prichard, 1998). (Seral stage and status are related, but not synonymous. A sere requires a succession history at one or many sites, while condition and status are based on sampling a wide range of habitat conditions. An example of how status varies between ecological types is *Juncus balticus*, which is associated with mid ecological status in wet meadow habitats, but with high status in moist meadow habitats [Weixelman et al., 1996]).

So for historic reference – depending on watershed position – the distribution of different ecological statuses in riparian habitats was likely to be fairly even. Wetland reference conditions are identified in soil and vegetation survey for Gerber's catchment (Riegel et al., 2002, Soil Survey Staff, 2002). The survey provides reference species composition for ecological status (condition).

Extent of Wetland and Riparian Distribution

In reference condition, stringer forests along Gerber's draws were probably mostly meadows. Meadow losses are a striking part of forest vegetation change from historic vistas (Gruell, 2001). In Yosemite Valley there may now be less than 25 percent of the extensive meadows and black oak, which occupied much of the valley floor in 1899. Forested draws in Gerber may have experienced a similar fate to draws in Markleeville, which were stringer meadows and with scattered aspen in 1925 that have changed to wooded pine draws in the late 1900's. Prior to human influences of livestock grazing and fire suppression, conifer expansion into riparian habitats would have been uncommon.

Emergent wetlands were more abundant prior to construction of dams, roads, stock ponds, and other modifications. It is estimated that roughly 550 acres of various wetland habitats have been inundated by Gerber Dam alone (see Figure 3-3).

Water Quality

Temperature

Water temperature is a function of physiographic variables, such as riparian conditions, flow volume and timing, and channel conditions, and climate variables, principally air temperature. It is likely that water temperatures in the past were substantially lower than those observed recently. As discussed in the Hydrology, Stream Channels, and Riparian Vegetation sections, stream flows were higher during the warmest months, streams were narrower and deeper, and riparian vegetation was more abundant. As a result, the rates at which water warmed as it flowed downstream were lower than at present.

Regardless of the effects of more extensive riparian vegetation, generally higher summer flows, and narrower channels, the unaltered thermal regime in portions of some streams in the analysis area still may not have met state water quality standards. Streams flowing through dry rangelands, such as in the southwestern portion of the analysis area (e.g., Antelope Creek upstream from Duncan Springs), would have had very little shade, for instance. In particular, streams flowing across southern aspects at relatively low elevations would have been most likely to have elevated summer water temperatures.

Analysis to be conducted during the development of Total Maximum Daily Load (TMDL) allocations will provide insight into unimpaired (reference condition) and potential future temperature regimes of streams.

Springs and shallow groundwater discharge areas would have provided thermal refugia from naturally high water temperatures. It is assumed that the discharge from these springs was higher prior to increases in the density of juniper and conifers.

Sedimentation

As discussed in the Stream Channels section, bank erosion rates were likely lower historically than they are at present. In addition, two major sources of sediment from uplands – roads and rangelands with high degrees of juniper encroachment – were not present or extensive prior to European settlement.

Nutrients
Nutrient loading in the analysis area was likely lower in the past than it is currently, although some subwatersheds may have periodically received pulses of nutrients. Natural background levels of phosphorous may have been elevated due to small amounts of phosphate-laden apatite, which occurs in many types of volcanic rocks.

Natural rates of nutrient loading were driven by contributions from soil erosion, groundwater leaching, and biochemical cycles. Soil erosion would have occurred occasionally across a large portion of the analysis area during overland flow events, and would have increased for short periods over small areas subsequent to brush and forest fires (DeBano et al, 1996). Stream channel processes (bank erosion in particular) also contributed to nutrient loading. Nutrient laden waters passing through well-vegetated riparian areas and wetlands likely experienced a reduction in nutrient loads.

Habitat for Aquatic Species

Overview
In general, aquatic species habitat in the Gerber/Willow Valley watershed is assumed to have evolved under similar climatic and hydrologic inputs as we experience today. Although direct accounts of species distributions and habitats are not available, it is possible to make inferences based on well-documented natural processes such as plant succession, stream channel evolution, and aquatic species life history strategies. Additionally, we have legacy features (trees, floodplain terraces, soils deposits) and accounts of early surveyors and homesteaders. Furthermore, archaeological evidence provides some clues as what food resources were available for exploitation.

An additional tool we have available for assessing departure from the historic condition is the reference reach. A reference reach is defined here is a stream segment that represents a stable or “undisturbed” channel with a particular valley morphology and a hydro-geomorphic function. By collecting physical and biological data in the reference reaches and converting the data to dimensionless ratios (e.g. # pools per mile as a function of stream width), we can use reference reach data to compare watersheds and streams of varying sizes.

In this section we will describe, in a general sense, watershed process that would have shaped the habitat for aquatic species and influenced their distribution and abundance. In section 5 we will use direct evidence as well as inference based on the reference reach values to compare probable habitat conditions prior to euro-American settlement to the existing condition Section 3). Parameters for this analysis were chosen based on the ability to infer from reference data and their importance as potential limiting factors for the species of concern (namely redband trout and Klamath sucker species) in the watershed. Selected parameters are:

- Fish passage and distribution.
- Stream temperature
- Spawning habitat
- Habitat complexity (amount of large woody debris and # pools/mi)

Species Distribution and Abundance
No exotic species would be present in the reference condition (Table 4-3). There were far less permanent lacustrine (lake-like) habitats historically. However, there were more emergent marsh and seasonal wetlands, which have either been drained to facilitate irrigation systems, flooded for water storage or have had channel incision leading to lowered water tables and dissociation with frequent flooding. Because of Gerber Reservoir, lake dependent species such as shortnose suckers have probably increased in abundance over the reference condition. Constructed reservoirs throughout the analysis area have allowed for the establishment of warm water species such as yellow perch, crappie, and largemouth bass. None of these species would

have flourished in the reference condition because of the lack of deep lacustrine habitat. The lower portions of East Branch of the Lost River and Miller Creek were likely used as migration and spawning stream for fish living in the Wetlands in the South end of Langell Valley.

Table 4-3. Assumed historic species list for the Gerber/ Willow Valley watershed.

Common Name	Scientific Name
Marbled sculpin	*Cottus klamathensis*
Speckled dace	*Rhynichthys osculus*
Klamath largescale sucker	*Catastomus snyderi*
Shortnose sucker	*Chastmistes brevirostris*
Lamprey	*Lampetra similis*
Pit-Klamath Brook lamprey	*Lampetra folletti* (syn. *L. lethophaga*)
Tui chub	*Gila bicolor*
Redband trout	*Oncorhynchus mykiss*

Although there is no documented reference to fish species occurrence and distributions prior to the construction of Gerber Dam, reference stream and wetland conditions would have supported populations of native stream fishes including shortnose sucker, largescale sucker, Klamath redband trout, Klamath speckled dace, marbled sculpin, and migratory parasitic and non-parasitic lamprey species. The long distance from a large lake habitat coupled with some steep stream gradients in Miller Creek canyon, probably precluded Lost River Suckers, lake dependent sculpin species, blue chub, and adfluvial forms of redband trout from all but the lower reaches of Miller Creek an the East Branch of the Lost River. Tui chub could have been present in low numbers in year round marshes such as the one that existed at the bottom of Barnes Creek and in Barnes Valley proper.

A reasonable explanation for the current distribution of shortnose suckers, Klamath largescale suckers, and tui chub is that the marsh at the bottom of Barnes Creek supported these species, albeit in relatively low numbers, prior to the dam (USDI-FWS, 1992). Even if these marshes did not support resident populations because they periodically dried up, it is reasonable to assume that some migrating adult and juvenile suckers, or stream resident suckers, could have been trapped behind the dam upon its construction and developed into adfluvial sub-populations within Gerber reservoir. Stream resident suckers are routinely observed by BLM in Long Branch Creek. The same explanation for the presence of redband trout is also plausible although, there have been numerous supplemental stockings of hatchery raised trout which could also explain their current distribution. An alternative explanation is that neither suckers nor trout were present in the watershed and both were at some point transplanted into Gerber. However, given their life history and habitat requirements, and accounts of early homesteaders (Sobel et al, 1992) it seems unlikely that suckers and trout were not present in the watershed during the construction of Gerber dam. Additionally, migratory trout and suckers were known to inhabit the Lost River (Ray 1963). The reservoir then provides an opportunity to express an adfluvial life history strategy. The ability of redband trout and potentially some sucker species to switch from resident to fluvial or adfluvial strategies is inherent and not easily lost to selection, even after many generations.

The following general description of interior basin redband trout life history excerpted from ODFW (1995) is appropriate for the Gerber/ Willow Valley historic condition:
"In most basins, it appears the redband trout established adfluvial life histories, migrating among highly productive rearing areas in lakes with adjacent marshes and spawning areas in streams or among productive marshes and streams. The marshes and lakes connected various populations that entered them from different drainages in the basins. During drought episodes that caused complete desiccation of the lakes and marshes, streams provided refuges for populations that returned to the lakes when they refilled"

Fish Passage
No culverts, dams, diversions or road crossings would have inhibited free passage and migration of fish. Fish lost due to reaches periodically dying out would have readily re-colonized from the Lost River and headwater perennial streams such as Lapham Creek, Casebeer Creek, and Barnes Creek. Pre-dam flow records from the mouth of Miller Creek suggest that that stream periodically became intermittent; however, flow was recorded as “zero” in only three of the 10 consecutive years of record (Figure 4-1). It is not known how much early homesteaders had altered flows by these dates. General Land Office surveyor notes (September 1868) indicated and “water holes” and “sloughs” present is several of the Barnes Valley Creek section line crossings. Marshes were noted by the early GLO surveyors in Langell Valley, Barnes Creek and Barnes Valley proper. These may have also provided refugial habitat. It is apparent that low flow would have inhibited free passage for much of the year in the larger streams.

Stream Temperature
High stream temperatures probably did not limit distribution of suckers, lamprey, sculpin and other chub and minnow species because these species have a relatively high metabolic tolerance compared to salmonid species. However, temperature effects of dissolved oxygen and other water quality dynamics such as biological oxygen demand could indirectly cause problems for these species. Results of recent redband trout tolerances to high stream temperature suggest that redband trout have a higher tolerance for temperatures above 64 F than do hatchery strains (Rodnick et al draft manuscript 2002). Redband trout were likely abundant as resident life history forms in the perennial spring fed tributaries such as Casebeer Creek, Barnes Creek, and Lapham Creek. Year-round occupation of redband trout in Barnes Valley Creek is possible but may have depended on base flows sufficient to moderate summer temperature extremes. Evidence from surveyor notes in the Gerber Reservoir area in 1868 suggests that in September of that year Barnes Valley Creek and Miller Creek had perennial but interrupted flows, that is some areas were described as “sloughs”, streams, and some as “water holes” Given that several spring fed tributaries entered in the area that is now Gerber, it is likely that cold water inputs were sufficient to sustain resident population in those tributaries and in the perennial sections of Barnes Valley Creek and Miller Creek. Additionally, the larger tributaries (Miller Creek and East Branch Lost River) may have been migratory and rearing habitat for fluvial or adfluvial redband trout from the Lost River and associated lakes. Large trout are currently seasonally present in lower sections of Miller and East Branch Lost River. A comparable situation exists in the Sycan watershed where the headwater streams are perennial and stream reaches below a large wetland are somewhat intermittent. Throughout the Klamath basin, small spring-fed headwater streams are productive resident trout streams and provide important refugia areas during periods of drought.
Trout often occupy positions in the stream that are much colder than the average stream temperature. These hyporeic zones are areas where groundwater exchange provides areas of relatively cool water.

Large Woody Debris
Large woody debris for the 50^{th} and 75^{th} percentile of natural and near natural streams in the northern Great Basin (Quigley et al 1997) is suggested as a benchmark for historic conditions. Since this data was collected in primarily forested streams it may suggest higher values than were historically attained in the Gerber/ Willow Valley area which has a high percentage of streams in range areas.

For this assessment, LWD is defined as being 20 inches in diameter on the small end and greater than 35 feet long in ponderosa pine and mixed conifer sites. The natural or near natural frequency is determined using the table below, and the formula for desired numbers per mile = table value x 5280/average riffle width in feet (Quigley et al 1997). For example, a stream with a 10-foot average riffle width and a slope of 2-4% would be expected to have 11 pieces of LWD/mile at the 50th percentile and 45 pieces at the 75th.

Table 4-4 - Natural or Near Natural Frequency of LWD in Northern Great Basin Streams

	Large Woody Debris/Mile	
Slope Class	**50th Percentile**	**75th Percentile**
All	0.019	0.062
<2%	0.006	0.025
2-4%	0.02	0.085
>4%	0.02	0.067

Pools

he number of for 50th and 75th percentile of natural and near natural streams in the northern Great Basin (Quigley et al 1997) is suggested as a benchmark for historic conditions. The natural or near natural frequency is determined using the table below, and the formula for desired numbers per mile = table value x 5280/average riffle width in feet. For example, a stream 10 feet wide with a slope of <2% would be expected to have 14 pools/mile at the 50th percentile and 28 pools/mile of at the 75th percentile. Pool width/depth ratios are another measure of habitat quality that is applicable in a dimensionless ratio.

Table 4-5 - Natural or Near Natural Frequency of Pools and mean width/ max depth ratio in Northern Great Basin Streams (Quigley et al 1997).

	Pools/Mile (all pools)		Mean width/max depth	
Slope Class	**50th Percentile**	**75th Percentile**	**50th Percentile**	**75th Percentile**
All	0.027	0.049	5.6	4.2
<2%	0.027	0.053		
2-4%	0.029	0.044		
>4%	0.030	0.051		

Spawning Gravel Fines

The reference level of fines for each particular geologic type has not been identified; however, analysis shows that a level of less than 30% fines is generally attainable in the top four inches of spawning substrate throughout the Fremont National Forest. In Antelope Creek, values were between 18.5 and 26.3 in the reference reach. Based on this information and values from Quigley et al (<25% fines) we can compare assumed historic condition and existing condition.

II. Vegetation

The best information available on the historic vegetative types in the Gerber/Willow Valley Watershed comes from the 1946 and 1947 Fremont National Forest Timber Type Maps. While the terminology used in this historic mapping differs from designations currently in use, the information can be used to provide a comparison of historic and current forest vegetation conditions. The table below summarizes the information contained in the 1946 and 1947 Timber Type Maps. National Forest lands and adjacent lands are included, together, in the data. Similar data is not available for BLM or Modoc National forest lands, but the vegetative condition shown can be assume to also represent these ownerships.

Table 4-6. 1946-47 Vegetation Condition on Fremont National Forest

Vegetation Type	Approximate Acres	% of Inventoried Area
Ponderosa Pine - Large	39,400	17
Ponderosa Pine – Small	8,200	3
Ponderosa Pine - Seedling, Saplings and Poles	12,800	5
Mixed Pine - Large	2,800	1
Mixed Pine – Small	1,200	0.5
Mixed Conifer – Large	5,900	3
Mixed Conifer – Small	4,700	2
Mixed Conifer – Seedlings, Saplings, Poles	8,200	3
White Fir	80	<1
Ponderosa Pine Woodland	13,700	6
Lodgepole	100	<1
Juniper	39,000	17
Deforested	1,600	0.7
TOTAL FORESTED	**137,800**	**59**
Grass, Sagebrush, Brush	92,000	39
Water	5,400	2
TOTAL FOREST and NON-FOREST	**235,200**	**100**

Forested Uplands

Historically, the size, structure, composition, and spatial arrangement of the three basic forest plant community types that exist within the Gerber Watershed (ponderosa pine, mixed conifer, western juniper) were mainly the product of natural fire frequency and intensity. Other disturbance factors were locally important, but fires were the main driver of composition and plant succession. Aboriginal burning in this area was likely practiced but was not significant on a landscape basis.

Three important concepts of fire ecology are as follows:
There is an inverse relationship between fire frequency and intensity.
There exists a direct relationship between the degree of deviation from historic variability and the number of "fire cycles" skipped due to artificial pressures. Skipped fire cycles tend to accelerate "biologic" plant succession.
Not only is there variability of fire frequency and intensity between plant associations, but the frequency has also varied over time (Agee 1993).

Ponderosa Pine

Ponderosa pine forests are fire dependent communities. Denied a fire every 5 to 25 years, fuels build up, and probability of catastrophic stand replacement fires greatly increases (Stephen Pyne 1996). Frequent light surface fires with a low degree of variability characterized the natural fire regime for ponderosa pine. Historic fire return intervals of 1 to 25 years have been measured within similar watersheds. In other words, based on core sample research throughout the region, these stands burned on a regular basis with a high degree of predictability. Stand replacement fires were very rare. The average ponderosa stand today has skipped approximately 10 fire episodes and shows the greatest departure from reference conditions.

1. Spatial Arrangement

Naturally occurring fire maintained ponderosa pine type stands at different spatial arrangements on the landscape than exist today. Historically, ponderosa pine forests grew in clumps of even-aged, relatively uniformly spaced trees, a condition that was sustainable in a fire dependent ecosystem. Fires crept through the understory consuming branches, litter, grass and forbs on the forest floor. Ponderosa pine tended not to expand out through the sage and grass communities as today. Looking at the edge of most grass/sage "meadows" there typically is a band of young ponderosa pine, 100 to 300 feet wide in front of the Late or Old Successional (LOS) ponderosa stand. This band of younger trees has typically encroached into the meadow as a result of the elimination of fires this century.

Unlike the ponderosa invasion into the drier end of its range, ponderosa pine has been displaced by true fir at the wetter end. These stands are progressing in biological plant succession. In general, most of today's mixed conifer plant communities, on all aspects below 6000 feet, and on south and west aspects above 6,000 feet were dominated by ponderosa pine with a fire frequency pushing the higher 25-year interval.

Ponderosa pine stands tended to be large and extensive across the landscape. Gaps and patches occurred at irregular intervals across these stands. They probably ranged from 1/4 acre to as large as 40 acres (Hopkins 1993). Fragmentation across the landscape would have been considered low at the large scale yet some stands may have contained a higher degree of patchiness at a finer scale. Other disturbance factors had little effect on the large-scale spatial arrangement of ponderosa pine types. Due to the uneven-aged/even-sized/ low stocked nature of the canopy, these stands were highly resistant to large-scale mortality. Insect activity was light. Infestations at the stand level would have been rare due to the fact that the fire regime wouldn't allow stand densities to grow to a high-risk condition. Trigger factors for bark beetle attacks would have been at the singular tree or small group level; i.e., lightning and fire scars or a patch of age related mortality.

2. Size/Structure

When John C. Fremont explored this region in 1843, he reported finding vast stands of timber typically described as "open" or "park-like." There were few, well-spaced trees of mammoth size (Hopkins 1993). In general, the ponderosa pine types tended to have LOS, single stratum characteristics, maintained for long periods of time by low intensity surface fires. Amounts of shrubs and large down wood was variable but tended to be sparse. The multi-strata structures we see today couldn't exist long in this historic fire regime. Though the stands where single stratum, there was a great variance in ages within the canopy. Pulses of regeneration would escape the understory in patches ranging from 1/4 acre to as much as 40 acres then maintain as co-dominants in the canopy.

The ponderosa pine forests tended to look "park like" and carry much less stocking than the stands of today. It is estimated that these forests produced as much as 30% less biomass than today (Hopkins 1993). These uneven-aged /even-sized stands tended to be resistant to most other disturbance factors. Insect, wind, or disease mortality was largely restricted to individuals or small groups of trees. The larger gaps allowed shade intolerant ponderosa to regenerate. Due to the single-stratum structure, dwarf mistletoe was less prevalent. Frequent fires would have eradicated heavy infections and aided in creating gaps for regeneration. Root diseases would have been opportunists infecting the oldest and weakened trees. Their virulence may have been kept low due to the resistance of the pine species. Comandra blister rust is a little known pathogen. Ecologists suspect that up to 10 percent of trees exhibited spike tops caused by the disease (Hopkins 1993). This process helped maintain snag habitat in an environment where true snags burned up quickly. Ponderosa pine plant communities today exhibit the greatest departure from reference conditions.

<u>Reference Condition Seral Stage Distribution in the Ponderosa Pine Type*</u>

Early to Mid (unstocked to small sawtimber)	20% (95% single story, 5% multi story)
Late (medium sawtimber and greater)	80% (95% single story, 5% multi story)

*Data interpreted from the 1994 REAP Report and the 1947 timber type map.

Mixed Conifer

The natural fire regime for mixed conifer types is characterized by a highly variable range of intensities ranging from infrequent severe surface fire to long return crown fires. The associated fire return frequencies range from 25 to 300 years. Fires burned on an irregular basis with a low degree of predictability. The average mixed conifer stand today may have skipped 1 to 2 fire cycles. Wildfires today probably cover more acreage and burn hotter than they did in the past but inherent variability has prevented generalizations about fire and its ecological effects. In general, the mixed conifer stands have not changed as radically as have the ponderosa pine type.

1. Spatial Arrangement

In general, mixed conifer stands have expanded aggressively into the drier ponderosa pine. A patchwork of even-aged and uneven-aged stands result from the variability of past fire intensities.

True mixed conifer stands tended to be variable in size but remained somewhat fragmented. Many of the mixed conifer patches were actually stands that functioned as ponderosa pine types.

2. Size/Structure

In general, the mixed conifer stands tended to be small and variable exhibiting a gradient of seral conditions across the stand as well as the landscape. The younger end of this gradient tended to be even-aged/even-sized “pioneer” species such as ponderosa pine. As the stands developed under a naturally long fire return interval, they became more uneven-aged and multi-storied as the shade tolerant “climax” species developed. Vertical diversity developed as gaps opened up and shade-tolerant fir advanced. Stands tended to look “jumbled up” with complex structure. Reference period density is generally less than what we see today, although not as drastic (on the average) as what has occurred in ponderosa pine types.

Other disturbance factors were more significant in the mixed conifer than they were in ponderosa pine. With longer fire return intervals, stands tended to reach target densities attractive to fir engraver and bark beetles. Mistletoes had the time and stand structure to build up to heavy levels. Root diseases would not have been present at current levels but would have persisted as opportunists. There would have been much more disease activity in the mixed conifer stands than would have been expected in the ponderosa pine type keeping in mind that much of what we recognize today as mixed conifer, functioned as ponderosa pine during the reference period. This mosaic of ponderosa pine/mixed conifer/fire frequency brought a certain level of resiliency on a landscape scale.

<u>Reference Condition Seral Stage Distribution in the Mixed Conifer Type*</u>

Early to Mid (unstocked to small saw timber)	40% (95% single story, 5% multi story)
Late (medium sawtimber and greater)	60% (5% single story, 95% multi story)

*Data interpreted from the 1994 REAP Report and the 1947 timber type map.

Juniper Communities

(Refer to the following *Non-Forested Uplands* section for a discussion of Western juniper communities.)

Non-Forested Uplands

BLM Administered Lands - (The "Gerber Block")

As discussed earlier, the BLM administered lands within the Gerber Block had an Ecological Site Inventory (ESI) performed on them during the 1997 and 1998 field seasons. The existing conditions, as determined by the ESI, were covered in Step 3. This section will briefly describe the best estimate of ecological conditions, by ecological site or group of sites, that existed prior to significant Euro-American settlement (i.e. prior to about 1865-70). These plant communities are what was believed to have occupied these sites pre-settlement and as such, are considered a relatively stable state assortment of plants that evolved on and with the particular ecological site. Since no specific vegetation information actually exists from the pre-settlement era, the current estimates of the Potential Natural Community (PNC) are based on relict area observations (i.e. areas that are relatively undisturbed) and the professional judgment of the ecological site description author(s). Some of this reference condition information was addressed in Step 3, since the ESI found portions of many major ecological sites classifying as PNC and upper late seral condition (see Table 3-24 in Step 3). Step 5 - Synthesis and Interpretation will compare existing conditions (Step 3) to the reference conditions (this section) and analyze the differences relative to pertinent resource objectives. Step 5 will also summarize the data from existing rangeland monitoring studies (where such information exists) to help ascertain the causes of undesirable differences between the existing and reference conditions. This will all lead into Step 6, which will recommend potential management changes.

As noted in Step 3, one primary concept can be stated about what determines the seral stage or condition of most ecological sites in the analysis area, which is: The higher the proportion of perennial grasses present on a given site, the higher the seral stage and relative condition class. All of the non-pine ecological sites in our area were dominated by native perennial grasses, making up 40-70% of the community in the higher seral stages, which would include communities in PNC and the upper end of the late seral category (i.e. >65% similarity to the currently approximated PNC). This span of condition class variation is believed to represent the composition of the majority of the pre-disturbance vegetation communities. Wild fires, drought, insects infestations, wild herbivore population fluctuations, and other "natural" environmental pressures or variations would have caused some percentage of the landscape to be in a sub-PNC condition class even before Euro-American settlement. Impacts from the activities of Native Americans also caused localized suppression of ecological conditions, e.g. human induced fire and vegetation gathering activities.

As discussed earlier in this analysis, the uncontrolled, heavy grazing pressures that this area received during the first 50-60 years of settlement (free-range period) invariably caused profound changes in the vegetation communities. The primary pressure for livestock induced ecological change was (and is) the selective preference of domestic grazing animals (cattle, sheep, and horses) for herbaceous vegetation - particularly grasses - over the more woody species like the sagebrush and juniper. Grasses were grazed heavily and season-long, severely suppressing their vigor and giving a competitive advantage to the less grazed or non-grazed plants. With continued heavy grazing pressure, the woody vegetation increases and the remaining grasses receive even more grazing and competitive pressure, accelerating their diminishment in the plant community. Eventually, the sagebrush and juniper dominate the site, and given the competitive edge of juniper over sagebrush, particularly the big sagebrush species, juniper can eventually overwhelm a site. In the absence of fire to remove the thick juniper, some sites can reach a stable, juniper dominated equilibrium that cannot be altered without large-scale artificial removal or catastrophic fire. Since early settlement, fire has diminished as an element in controlling vegetation ecosystem conditions, due primarily to fire control activities and the removal of the herbaceous vegetation by grazing, making the spread of fires less likely, or extensive.

There are, however, some variations on the above themes that are thought to be at work in the Gerber Block. The naturally thin, clay dominated soils - which may have become thinner because of erosion during the intense grazing pressures of the free-range days - appear to suppress or slow down the domination of juniper in most of the “old juniper” ecological sites; sites which comprise about 45% of the Gerber Block. This is not true in the deeper, loamier soil areas like the private lands along the edges of Langell Valley where juniper is dominant in areas which big sagebrush and bunchgrasses naturally dominated.

In addition, most of the Gerber Block is at a higher elevation with a higher average precipitation amount than the lower lands to the west (Langell Valley), but not so high that conifers can dominate like the USFS lands to the east. This relatively high precipitation has allowed rangeland conditions to restore more quickly than the lower areas. Specifically, the average yearly precipitation at Gerber Reservoir (4850') is over 18", whereas the average in Klamath Falls is just over 13", which is about the same as Langell Valley receives. This extra amount of average precipitation is enough to equate to a substantial increase in vegetation response potential, compared to the lower areas. Anecdotal information persuasively indicates that vegetation conditions at passage of the TGA in 1934 were highly degraded throughout the area, though no specific data exists to quantify the levels of deterioration. The noted “wetter” conditions, in conjunction with the post-Taylor Grazing Act (TGA) livestock controls, are the primary reasons that 83% of the Gerber Block ESI classified as either PNC or late seral conditions. Given the high current condition ratings, there has invariably been dramatic improvements in conditions, albeit slowly, over the past 65 years. Conversely, the lower (<4700') and drier (13"-15") areas in the southwest corner of the Gerber block have not made the dramatic improvements that the higher areas have, though these areas are thought to have improved modestly.

There are, however, differing vegetation types and potentials throughout the Gerber Block. Specific reference conditions (PNC in ESI parlance) are covered in the following narrative on an ecological site-specific basis. More detailed information about each ecological site in various seral stages is found in Step 3. This section will be structured like Step 3, but briefer. Much of the information for this section is derived from the draft Klamath and Shasta Valleys and Basins (MLRA D-21) Rangeland Ecological Site Descriptions (USDA-NRCS 2000).

A few general statements can be made that pertain to these communities in pre-settlement, PNC condition. They are as follows:

There would be no exotic annual grasses and forbs present in the communities because they did not exist in the area until the influx of Euro-American settlers imported them, inadvertently or intentionally.
Native annual forbs and grasses, like willow herb and annual hairgrass (*Deschampsia danthonioides*), would be minor components of the plant communities except in areas of natural disturbance such as recent wild fire areas or wild ungulate concentration areas in meadows or at watering locations.
PNC vegetation conditions did not dominate all or even a majority of any given area during pre-settlement days, nor should it be expected to absolutely dominate today. Even in pre-settlement days there was inevitably wide latitude in plant community and species composition within each currently defined and distinct ecological site. It is the human penchant for classifying and categorizing that forces these plant communities into a relatively few, discrete units - communities which in nature existed and still exist on an infinite continuum of gradations. The ranges built in to the PNC species descriptions try to account for this latitude, but can only to a degree. In any event, the current ecological site descriptions represent the best that can be estimated of past, pre-disturbance conditions from this juncture in time.

(Note: The species percentages (in parenthesis) in the following descriptions refer to its relative abundance in the total community based on typical year’s growth.)

Meadow Communities

Meadow communities total 2.7% of surveyed area. As noted in Step 3, the ESI did not specifically classify riparian/wetland type areas, with the exception of the three sites that follow. Another survey was envisioned to classify the riparian areas to the degree befitting their importance. See the Riparian Section for more information on riparian vegetation.

Dry Meadow (0.8% of surveyed area) - This site is widespread throughout the Gerber Block, but not in much quantity. At PNC, this ecological sites' visual aspect would be dominated by silver sagebrush (10-15%) with the understory dominated by Nevada bluegrass (50-60%); both species a reflection of the seasonally saturated soils. There would also be 10-20% composition of other native perennial grasses and up to 10% native forb species. Yearly production could exceed 1000 lbs/acre. Juniper did not generally invade this ecological site due to the seasonally saturated soils. Fire occasionally encroached late in the season when conditions were typically dry and may have helped keep silver sagebrush as a production sub-dominate to the perennial grasses. Silver sagebrush is, however, an aggressive post-fire resprouter, so fire would be only partially effective in limiting it abundance.

Ephemeral Lakebed (1.8% of the surveyed area) - This ecological site is also widespread in relatively small parcels throughout the Gerber Block. At PNC, this site was dominated by spikerush (60-70%), with a few other grass and grass-like species (rushes and sedges) present in smaller amounts (10-20% total). Twin arnica (Arnica sororia) and aster (Aster spp.) would be the primary forbs, though others could be present up to a total of 10% composition. Due to the relatively deep soils and ample moisture, this site typically produces 1200-1500+ lbs/acre yearly. These same soil conditions also make juniper invasion virtually impossible. Fire was probably a minor factor in the overall composition of this site, though likely did occasionally burn through in the fall, reducing the senescent growth ("thatch"). As with the other two meadow sites, fire was a function of the flammability of the surrounding upland vegetation types; i.e. the more the surrounding uplands burned the more likely the meadows burned.

Semi-Wet Meadow (<0.1% of surveyed area) - This ecological site is an extremely minor vegetation component of the Gerber Block. This site is also seasonally saturated similar to the Dry Meadow site, but tends to be found as small inset pockets within larger upland areas. At PNC, it would be dominated by California oatgrass (75%) with a mix of other species like Nevada bluegrass, sedges, and rushes making up most of the remaining composition. Forbs may be as high as 10% and shrubs were rare if present at all.

Shrub/Bunchgrass Communities

Shrub/Bunchgrass communities total 31.4% of surveyed area.

a. Low Sagebrush Dominated Communities - As noted in Step 3, low sagebrush is by far the most abundant shrub species in the Gerber Block; a function of the shallow soils. Four ecological site descriptions cover all of the non-juniper, low sagebrush vegetation types, though the first two cover 97% of low sagebrush classified acres.

Shallow Stony 10-20" (18.1% of surveyed area) - This is the most common of the non-juniper ecological sites in the Gerber Block. At PNC, this community was dominated by Sandberg's bluegrass (60-65%) and low sagebrush (5-15%). Common sub-components of this site include single-spike oatgrass (up to 10%), bottlebrush squirreltail, Idaho fescue, and bluebunch wheatgrass (up to 15% composition in total). Native forbs totaled about 10%, with a surprisingly rich species diversity (Miller, et.al. 1999). Shrubby buckwheat (Eriogonum spp.) was also common though usually <5% composition. Due to the thin soils (<12") the production potential is very limited, averaging 250-300 lbs/acre of growth per year. Biotic crusts were probably very abundant on this site and still are to large extent. Juniper was and is slow to encroach in to these sites because of the shallow soils. Due to the very limited production, fire is an infrequent occurrence in these areas, with a cycle that was probably 100-200 years. Even though infrequent, it was probably frequent enough that in conjunction with the thin soils, significant juniper invasion was rare.

<u>Stony Claypan 14-20"</u> (10.3% of surveyed area) - The Stony Claypan ecological site is also common throughout the Gerber Block, though more so in the higher northern and eastern portions of the area. At PNC, this community is typically dominated by Idaho fescue (40-45%) and low sagebrush (10-20%), with significant sub-components of Sandberg's bluegrass (10-15%), single-spike oatgrass (up to 10%), and bottlebrush squirreltail (2-5%). Forbs can total up to 10% of the community and like the Shallow Stony site, can have rich species diversity. At the drier end of this sites environmental latitude, bluebunch wheatgrass can be common (up to 5%). Average yearly production potential is 800-1000+ lbs/acre depending on site-specific rockiness and soil depth. Due the relatively high production, fire probably exerted a significant influence on the structure of this community, periodically reducing the shrubs and juniper encroachment. Since this site is essentially a Juniper Claypan 16-20" without the trees and somewhat less rocky, it could be considered a fire climax version of that Juniper site. Conversely, if the Stony Claypan site were to avoid fire for an extended period and a significant number of juniper reach 150 years of age, it would be classified as the Juniper Claypan ecological site.

<u>Claypan 14-20" & Claypan Bottom 12-18"</u> (1.0% of surveyed area) - Both of these ecological sites are found infrequently in the Gerber Block, but are similar enough to be considered together, as they occupy similar locations on the landscape. At PNC, both sites are dominated by Idaho fescue (30-50%), a mix of other perennial grasses totaling 15-20%, and low sagebrush (10-20%). The primary difference between the two is that the Claypan Bottom will have a significant component of Nevada bluegrass (up to 15%), reflecting it's somewhat wetter nature, whereas the Claypan will not. Both sites have a diverse mix of forbs up to about 10% composition and have a relatively high production potential of 1000-1200 lbs/acre. Since these sites have much similarity to the Stony Claypan (just slightly moister), fire was also a significant factor. Specifically, fire probably exerted a moderate to high influence on the Claypan site and low to moderate on the Claypan Bottom site, keeping the sagebrush canopy relatively sparse and limiting juniper presence and/or density.

b. Big Sagebrush/Bitterbrush Dominated Communities (totals 2% of surveyed area) - Only one subspecies of big sagebrush is commonly found within the Gerber Block - mountain big sagebrush. Big sagebrush and bitterbrush, though common throughout the Gerber Block, are rarely abundant enough to define an ecological site. Additionally, bitterbrush was and is present in virtually all of the non-riparian/wetland ecological sites in the analysis area, though probably at levels somewhat lower than during the pre-settlement era (which is probably somewhat true of big sagebrush also).

<u>Shrubby Loam 16-20"</u> (0.8% of surveyed area) - This ecological site is found sporadically through the center and northern portions of the Gerber Block. This site is co-dominated by mountain big sagebrush and bitterbrush (10-15% each), with a significant understory of Idaho fescue (35-50%), Sandberg's bluegrass (5-10%), and other perennial grasses (10-15% total). A healthy, diverse, mix of perennial forbs was also present up to 10% composition. Due to the deeper soils on this site, production potential is relatively high and can reach 1000-1200 lbs/acre. Fire was a determining factor in community structure, with frequencies estimated in the 20-40 year average interval range. This relatively frequent burning kept the shrubs in check, because neither big sagebrush nor bitterbrush are adept as resprouters. Even more importantly, frequent fires keep the increase of juniper to low levels. Currently, encroachment of juniper and subsequent crowding out of site-typical shrubs and (to some extent) grasses is a major concern on these sites.

<u>South Slopes 14-18"</u> (0.9% of surveyed area) - The South Slopes ecological site is found in the central and southern portions of the Gerber Block. At PNC, this site is typically dominated by bluebunch wheatgrass (40-60%) with significant amounts of Idaho fescue (Up to 10%) and a shrub overstory of mountain big sagebrush (5-10%) and bitterbrush (2-10%). A mix of other shrubs and forbs, totaling up to 10% for each category, would also be present. Juniper would be a small component of the community (<2%) at PNC. Annual production potential is 900-1200 lbs/acre. As with the Shrubby Loam site, fire was a primary factor

in maintaining community structure, with frequencies probably in the 20-40 year average interval range. (See the Shrubby Loam write-up for details.)

North Slopes 14-18" (0.1% of surveyed area) - This is the only ESI defined bitterbrush site, though the Shrubby Loam site has it as a co-dominant. At PNC, this site's aspect would be visually dominated by bitterbrush (5-10%), with some mountain big sagebrush (2-5%), an understory of Idaho fescue (50-70%), and a diverse mix of other perennial grasses (totaling as much as 30% if the fescue is at the lower end of its composition range). Forbs would only make up about 5% of the composition, though overall annual site production would be high - 1000-1500 lbs/acres. As with the above two sites, juniper would largely be excluded from this ecological site by relatively frequent fires.

c. Mahogany Communities - As discussed in Step 3, mountain mahogany is a common, though rarely a distinctly dominant species within the Gerber Block. One ecological site is defined by mountain mahogany - the Mahogany Rockland 10-20" site (0.2% of the surveyed area). Though this site is highly variable, in PNC this site would typically have mahogany and bitterbrush as co-dominates (5-10% each) with a mixed age structure of both species and little of the collapsing (dying) mahogany we have seen in recent years. (See Step 3 for more information on this subject.) There would also be a wide array of other shrub/tree species present, including mountain big sagebrush, chokecherry and Klamath plum, snowberry, serviceberry, gooseberry/currant, ponderosa pine, western juniper, and other species in lesser quantities, but totaling as much as 15-20% of the overall composition. The understory would be dominated by Idaho fescue (35-45%) with many other perennial grass species potentially present up to a combined total of 30-35%. Forbs would be diverse but only totaling about 5% of the annual production, which would range from 1000-1200 lbs/acre. Production is, however, largely dependent on the amount of rock present which can be high. This vegetation community has probably had a relatively low dependency on fire, as most of the shrub and tree species are killed by fire and both mahogany and bitterbrush are weak resprouters. However, fire may have been necessary to inhibit the dominance of juniper and/or pine, open the canopy up for bitterbrush and mahogany to reseed, and/or stimulate see germination.

Juniper Communities

Juniper communities total 44.6% of surveyed area. Historically, true western juniper potential vegetation communities have made up the largest single class of ecological sites within the Gerber Block. (See the Juniper section in Step 3 for more information.)

Juniper Claypan 12-16" (15.3% of surveyed area) - This ecological site is the dominant "old growth" juniper site in the drier, southwestern and south central portions of the Gerber Block. The PNC areas are visually dominated by old juniper trees scattered out in a "savannah" type pattern, with an average of 8-15 old (>150 years) trees per acre. The understory is dominated by Idaho fescue (30-40%), bluebunch wheatgrass (15-35%), Sandberg's bluegrass (5-10%), and single-spike oatgrass (1-5%). Low sagebrush would be 5-15% of the composition, intermingled with a diverse mix of forbs totaling up to 5%. Annual production would be moderately high - 800-1000 lbs/acre - though production is highly dependent on the rockiness of the site (i.e. lots of rocks, less production). Fire would have historically exerted a relatively low influence in these sites, as indicated by the presence of very old juniper trees, which are often 500-1000+ years old. Young junipers would have been relatively sparse in the old tree interspaces, as the competition from the lightly grazed herbaceous plants would have been intense.

Juniper Claypan 16-20" (23.8% of surveyed area) - This ecological site is the dominant "old growth" juniper site in the moister, northern and eastern portions of the Gerber Block. This site was and is the most abundant ecological site in Gerber, making up almost one quarter of the ESI classified acreage. At PNC - which two-thirds of this type is still today - the vegetation community would be dominated by Idaho fescue (40-50%) and low sagebrush (10-20%), with the overall aspect visually dominated by scattered old juniper trees (5-

10+/acre). Several other perennial grasses would be in significant quantity - particularly Sandberg's bluegrass (10-15%) and single-spike oatgrass (up to 10%). Bluebunch wheatgrass, which was very common in the 12-16" site, would be scarce here, being found only in the driest landscape positions (e.g. south slopes or rocky ridges). Sites would typically have a diverse array of forbs totaling up to 10% of the community and site production would average about 800-1000 lbs/acre, again depending on the rockiness of a given site. As with the previous site, the presence of numerous old and very old trees indicates that fire has not been common in this site historically and must be considered a minor influence on community composition.

<u>Juniper Loamy Hills 10-14"</u> (1.6% of surveyed area) - This ecological site is found only in the extreme southwest corner of the Gerber Block. At PNC, this site would be visually dominated by a scattered stand of juniper trees, with patches of old trees intermingled with patches of younger trees. The understory would be dominated by bluebunch wheatgrass (35-45%), Idaho fescue (10-20%), Sandberg's bluegrass (5-10%), with several other perennial grasses totaling another 10-15%. The dominant shrub may have been mountain big sagebrush in some areas, though in the Gerber Block, it is believed to be a tall variant of low sagebrush (or a hybrid between the two, as discussed in Step 3). Forbs would, once again, be very diverse though only total up to 5% of the yearly production, which because of the deeper soils would be relatively high at 1200-1400 lbs/acre. This ecological site would be moderately dependent on and susceptible to fire as a community-determining factor. Because of the topography and/or surface rock, fires unevenly burned these sites resulting in the mosaic of young and old trees at PNC.

<u>Juniper-Mahogany-Fescue 16-20"</u> (0.3% of surveyed area) - This ecological site was newly described for the Gerber ESI in 1998. It is very similar to the following site except pine is absent. Since it is rare and probably a pine free derivative of the following site, the Juniper-Mahogany-Fescue site will not be discussed further; the following discussion will suffice.

<u>Juniper-Dry Pine 14-16"</u> (3.6% of surveyed area) - This ecological site is the driest of the sites with a significant ponderosa pine component and occurs in the southeast and south central portions of the Gerber Block. At PNC, the visual aspect of this site is co-dominated by a somewhat open stand of juniper and pine (30+% foliar cover of larger overstory trees), with a mid-story of juniper and pine reproduction (up to 10% composition of each). The understory would be dominated by perennial grasses, with Idaho fescue (15-30%), bluebunch wheatgrass (10-25%) and Sandberg's bluegrass (5-10%) being the most abundant. Shrubs would be primarily bitterbrush (5-15%), curlleaf mountain mahogany (5-10%), with minor amounts of many other species possible. Annual production would range from 1000-1200 lbs/acre with forbs being diverse, but again only 5% of the total. The actual composition and production of this site would have been highly variable and dependent on the amount of tree cover (i.e. more cover, less understory). Fire would have been a moderate factor in this community, periodically sweeping through the understory removing the shrubs and younger trees, but having minimal effect on the grasses or larger trees. Occasional stand replacing fires (i.e. fires that killed the bigger trees also) would set the burned portions of these communities back to mid/late seral for an extended time, until the shrubs and trees became substantially re-established.

Pine Communities

Pine Communities total 20.9% of surveyed area. Pine areas are more comprehensively addressed in the Forested Uplands section and will only be addressed here from the perspective of the Ecological Site Inventory data. One general comment is that both the pine sites are highly variable in plant community structure and species composition and quantity and cannot be particularly well classified by the ESI, as noted in Step 3.

<u>Pine-Mahogany-Fescue 16-20"</u> (6.1% of surveyed area) - This ecological site is a distinct transition between the true pine and old juniper potential areas. It is functionally a slightly higher and moister equivalent to the Juniper Dry-Pine site above and is found in the northern and eastern Gerber Block. At PNC these communities

probably had highly variable plant communities, but generally the understory was dominated by Idaho fescue (35-40%), Ross's sedge (up to 10%), and various other perennial grasses totaling another 10-15%. Forbs, though diverse, were only a minor component of this site, usually comprising 5% or less the composition. Shrub species are diverse but comprising a widely variable percentage of the composition, though often up to 45% of the total plant community. Species would be the same mix that would be found on the previously described Juniper Dry-Pine sites, with the addition of snowberry, manzanita, and snowbrush reflecting more precipitation. Annual production was in the 1000-1200 lbs/acre range but was highly variable depending on the thickness of the pine and juniper overstory, which would be at least 30-40% foliar cover. Pine reproduction would be up to 10% of the mid story composition reflecting the added precipitation boost to pine success, with juniper a minor component (up to 3%). Fire importance in this community would be the same as that discussed for the Juniper-Dry Pine site.

Pine-Sedge-Fescue 16-24" (14.8% of surveyed area) - The Pine-Sedge-Fescue ecological site is the most pine-dominated site found within the Gerber Block, occupying the deepest, non-meadow/riparian soils. It is also one of the more abundant ecological sites. Though again widely variable, at PNC these areas were dominated more by trees and shrubs than by grasses - a function of shading and duff accumulation. The composition of perennial grasses was dominated by Idaho fescue (15-25%), Ross's sedge (10-15%) and other species in lesser quantity. Shrubs were highly diverse with almost any species besides low sagebrush being possible. Dominant species would be snowberry (5-10%), mountain mahogany (3-5%), bitterbrush (up to 5%), squaw carpet and manzanita (up to 3% each), and many others as minor (<1-2%) components. Annual production would be approximately 800-1000 lbs/acre, but with wide deviation from this range. The overstory and mid story cover of trees would total at least 65% and primarily of pine; juniper would have been scarce or absent in most of these areas.

As with the prior two sites, fire would be of at least moderate importance and frequency in these sites. In this site, the fires would normally keep the understory fairly clear and understory production low - a "park like" appearance. Though infrequent, stand-replacing fires would allow the grasses and shrubs to be dominant for extended periods where annual production, in the absence of tree competition, could be twice the figure noted above.

FS Administered Lands

The ESI site descriptions would also apply equally to the Fremont and Modoc National Forest vegetation communities, as they lie within the same ecological province (MRLA D-21) as the BLM administered lands. Thus, no separate reference condition narrative is needed.

Noxious Weeds

All of the noxious weed species that occur within the watershed are exotic (introduced) to North America, mostly from Eurasia. Some native plants may have been undesirable to animals and/or humans, but would not have been considered noxious by the current definitions and standards. Therefore, these species were not present before Euro-American settlement, and the effects they have on species composition and relative abundance of species within invaded communities, and on the ecosystem processes that support those communities were not present.

Threatened, Endangered, and Sensitive Plant Species

Little is known concerning the historic distribution of special status plant species within the watershed. Many special status species are naturally rare within the communities in which they occur, or are restricted to particular, uncommon habitats even if they are abundant within those habitats. Species are classified into one of the special status categories when human activities alter relative abundance and species composition of plant communities or further reduce the abundance of uncommon habitats.

The long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*) grows in meadows, including low areas or drainages within low sagebrush (*Artemisia arbuscula*) scablands. These areas produce forage that is attractive to livestock. Therefore, long-bearded mariposa lily has most likely been reduced in abundance and distribution due to the impacts of livestock grazing and other human activities.

Baker's globe mallow (*Iliamna bakeri*) commonly grows on dry hilltop sandy soils with little or no overtopping canopy, and seems to be adapted to frequent fire. Therefore, fire suppression, both directly and indirectly through consumption of fine fuels by livestock, has reduced habitat for Baker's globe mallow. However, timber harvest practices that open the canopy in these forests may have partially offset these impacts to some extent. Overall it is likely that Baker's globe mallow has been somewhat reduced in abundance and distribution relative to reference conditions due to the impacts of fire suppression, livestock grazing and other human activities.

Profuse-flowered mesa mint (*Pogogyne floribunda*) grows in seasonal (vernal) wetlands characterized by silver sage (*Artemisia cana*). Therefore, under reference conditions, this species would be expected to occur in similar habitats throughout the analysis area. However, surveys of similar habitats in the Gerber area have not documented additional populations. The additional moisture produced forage that would attract livestock to these sites. Therefore, this species has probably been reduced in abundance and distribution relative to reference conditions due to livestock grazing and other human activities

Blue-leaved penstemon (*Penstemon glaucinus*) populations, which are adapted to natural disturbance in the lodgepole pine forest type, were more than likely present in early to mid seral succession lodgepole pine forests in reference times. As the overstory canopy closes in, habitat quality for blue-leaved penstemon declines. Therefore, fire suppression, both directly and indirectly through consumption of fine fuels by livestock, has reduced habitat for blue-leaved penstemon. However, timber harvest practices that open the canopy in these forests may have partially offset losses of habitat due to other human activities. Thus, blue-leaved penstemon may be present in abundance and distribution similar to reference times.

Fringed campion (*Silene nuda* ssp. *insectivora*) is found in relatively deeper soils of the sagebrush-steppe habitat, often associated with vernal streams and washes. The deeper soils and additional moisture produced forage that would attract livestock to these sites. Therefore, although fringed campion is probably somewhat tolerant of disturbance, it has probably been reduced in abundance and distribution relative to reference conditions due to livestock grazing and other human activities.

Fire and Fuels

Fire was historically the major disturbance in the Gerber/Willow Valley watersheds and all the major vegetation types in this watershed evolved with recurring fire. Other natural disturbance patterns, such as insects, disease, and windfall, are often related to fire. Forest Service fire exclusion policies were largely effective starting after 1920. However, heavy sheep and cattle grazing in the 1800s and early 1900s may have reduced fire occurrence even prior to implementing fire exclusion policies (Beckham, 2000). A lack of periodic fires since the late 1800's has resulted in high tree densities (25 – 50 historically; now can be as much as 400 – 1200 per acre), lots of in-filling with firs, and a fuel structure that ladders from the ground to the crowns.

In the lower elevation ponderosa pine communities, which were dependant on frequent surface fires, historic fires occurred on 8 to 12 year intervals. Early Native American and nineteenth century settlement burning shortened this frequency to 2 to 5 years. Studies indicate historic fire return intervals in juniper to be between 10 and 25 years, but may be considerably longer on isolated patches of juniper. Vast areas of grassland burned frequently whenever early season rainfall produced bumper crops of surface vegetation. Range fires historically controlled the spread of juniper trees throughout the Great Basin. Fire histories are extremely difficult to determine in sagebrush, but historical fire return intervals were probably between 10 and 50 years, depending on the site productivity. Even the high elevation true fir associations were shaped by fire, which occurred at approximately 40-year intervals in the Gerber Block (USDI-BLM 1994).

The size of historic fires varied depending on vegetation type, elevation and slope. On level terrain, fires were generally small but numerous. Large fires occurred when climate or weather conditions were favorable. Larger fires were more typical at higher elevations and on steeper slopes. The dry climate of South Central Oregon retarded the biotic breakdown of dead material that accumulated on the forest floor, creating a continuous cured and flammable fuel bed. Thunderstorms ignited the fuels, which then burned under a variety of weather conditions.

The vegetation on the forest floor was historically made up of forbs and grasses with pine needle and duff layers of less than ½ inch (typical fuel weight would be <14 tons/acre, including down logs). Historic accounts state that large woody material was essentially absent, being consumed by frequent surface fires. Snags were also subjected to the effects of fire, falling to serve as down logs (typically 50 linear feet of >12" material per acre at lower elevations). At upper elevations, where fire intervals were longer, fire events killed larger numbers of trees, which resulted in larger amounts of down woody material. Live trees were recruited by fire and insects to serve as replacement snags. Many green trees had dead “spike tops”. The “pristine” or “park like” look of the historic forest was often noted in writings of the past (USDI-BLM 1994).

Stand replacing wildfires occasionally occurred in the past, but they were atypical for the geographic area. Fuel succession had a short time interval at lower elevations. Each fire consumed much of the accumulated fine fuel and there was little time for fuel to accumulate before the next fire. Large fuels were consumed progressively by successive fires. Natural mortality and downfall of old trees was slow and scattered. Where patches of old trees died, it was generally a result of insects and blowdown. Grasses and possibly some forbs were stimulated somewhat selectively. Gradual replacement of the dominant, fire resistant trees with like species occurred. Fires were usually not intense enough to kill mature trees. Fires spared occasional seedlings of fire resistant species, which filled in openings caused by mortality of dominants. Fires were frequent enough to eliminate most reproduction of less fire-resistant species.

In the absence of naturally recurring wildland fires, the fuel on the forest floor deepens and needles become draped on shrubs. Shrubs become decadent, containing much dead wood. The volume of windfall increases and is accelerated by human activities, such as some types of logging and other silvicultural practices (i.e., precommercial thinning). Tree reproduction increases, often with species that are not fire resistant. Increased shade and wind resistance inhibit drying of fine dead fuels. The tree thickets themselves become fuel. Overstocked stands are more susceptible to the effects of drought and then insect attack. Mortality increases in the overstory because of an overstocked understory. Dead trees become aerial fuels that eventually fall and become surface fuels. Fire behavior changes while intensity increases. Fires under these conditions are likely to kill the entire timber stand, have a more severe effect on the site, and lead to even-aged forests (plantations). A fire ignition under dry fuels conditions is almost certain to become a crown fire; trees with fire scars going back 500 years are killed; soils are more deeply heated and damaged; many soils are made water-repellent by high heat driving volatile organics down into the cooler soil, where they congeal and seal; subsequent rains cause major erosion; and sites are seriously degraded as a result. These are fuels conditions far beyond the historic range, resulting in fire intensities, behavior, and size well above the historic range, and the risk of long term - if not permanent - ecosystem damage is high.

III. Terrestrial Species and Habitat

The number of acres of major habitat types has changed from pre-settlement conditions. Water, in the form of reservoirs, has increased which, in turn, decreased riparian-wet meadow and shrub-steppe habitats. Due to fire suppression, grazing, and other management practices, juniper has encroached into previously sagebrush and grassland dominated areas, reducing the amount of those habitats for shrub and grass obligate species.

Threatened, Endangered, and Sensitive Species

Bald Eagle – (Threatened, Proposed for De-listing) – No historic information on Bald Eagle abundance and distribution exists. Roosting habitat was probably more abundant and of higher quality prior to 1945. The predominance of late seral and old growth ponderosa pine in open park-like stands provided preferred roost sites and were relatively stable and resistant to catastrophic wildfire. Habitat security for eagles and upland prey populations were probably high due to low road densities and lower incidence of human use (USFS, 2000)

Bald eagles and their nests were likely less abundant prior to the construction of the numerous reservoirs that provide fish and waterfowl habitat. Gerber Reservoir, where most of the eagles currently nest, was a large meadow at the time of settlement. Bald eagles could have been in the area occasionally, feeding on carrion or rodents. It was very likely that bald eagles used ponderosa pine forests and stringers on the western edges of the watersheds for roosting areas as they foraged on waterfowl, etc., in Langell valley.

American Peregrine Falcon - (R-6 Regional Forester's Sensitive Species List; recently De-listed from Endangered) **-** No historic peregrine sightings or nest sites are recorded in the watersheds. In many areas in Oregon, peregrines populations were highly reduced prior to the ban of DDT in the late 1970's. This pesticide accumulation caused eggshell thinning and had extreme detrimental effects on peregrine nest success.

The quality and quantity of nesting habitat was probably similar to what occurs at present. Therefore, peregrine populations within the analysis area were likely historically low, as they were limited by number of nest sites. The cliff sites classified as potential nesting habitat may or may not have been occupied historically. The predominance of LOS open, park-like ponderosa pine stands provided only fair to marginal habitat for prey species (USFS 2000). Prey was probably common especially along meadow edges. Habitat security was higher due to low road densities and lower incidence of human use.

Northwestern pond turtle - (Federal Species of Concern; Bureau Assessment Species in Oregon) **-** It is likely that pond turtle populations were historically low within the analysis area. Prior to the construction of the numerous reservoirs that currently provide potential habitat, the area was likely dominated by tributaries and various types of meadows. The Lost river system and Langell Valley to the west of the watersheds probably provided good pond turtle habitat. Turtles probably dispersed from the Lost River into the drainages of the Gerber and Willow Valley watershed.

The average elevation of the analysis area exceeds the typical elevational range of northwestern pond turtles in Oregon. Historic population numbers were likely limited by this factor alone (Brown et al, 1995).

Bats - (Federal Species of Concern; Bureau Tracking Species in Oregon) **-** Silver-haired, long-legged and long-eared bats likely had more robust historic populations in the analysis area prior to the decline of LOS forests and associated snags. Silver-haired bat populations have declined in Oregon due to the loss of older Douglas-fir forests and associated snags. Long-legged and long-eared bats are associated with coniferous forests and cliffs; therefore, historic populations in the analysis area were likely only slightly higher than current numbers.

The pallid bats population within the watersheds was likely larger and more stable due to its known intolerance of disturbance. This bat readily abandons roosts when disturbance occurs.

Since the Yuma myotis readily uses buildings and other man-made structures for roost and maternal colony sites, populations of this bat may have increased since European settlement of North America.

Great Gray Owl - (BLM Survey and Manage Species, State Sensitive Vulnerable in Oregon) - The geographic location of the Gerber and Willow Valley watersheds may have historically been outside the range of the great gray owl. This owl is expanding its range in Oregon, taking advantage of openings within forests created by timber harvest practices.

Big Game

Mule Deer – Historically, populations of mule deer were likely variable. Mule deer were likely uncommon around the turn of the twentieth century. Historical accounts of the Interstate mule deer herd describe it as being small and scattered in the early 1900's. About 1930, deer numbers began to increase. By the mid 1940's range damage due to deer overuse was noted. The Interstate Herd was estimated at 14,000 to 14,600 deer in 1946. Reasons for the increase beginning in 1930 are not clear, but contributing factors probably include predator reductions, decreases in cattle and sheep grazing, weather variations, protection from hunting, and shifts in the fire regime leading to increased production of shrubby forage. Seasonal distribution of deer was most likely similar to what occurs today as deer traditionally use the same seasonal ranges over time.

Prior to 1870, deer ranges in lower elevations were probably dominated by shrubs with scattered or clumpy distribution of bunchgrasses. Distribution and density of both curl leaf mountain mahogany and bitterbrush were less than what they are currently. Heavy livestock grazing and later fire suppression combined to gradually increase shrub densities on all seasonal ranges. Consequently browse conditions increased in quality and quantity. By the 1930s and 1940s, deer numbers had increased to a point exceeding carrying capacity on most ranges and forage conditions began to degrade. Poor forage conditions on seasonal ranges were reported in the early 1940s (USFS, 2000).

Hiding cover prior to 1870 was probably adequate in most areas above 5,500 feet elevation, and poor over much of the range below 5,500 feet where more open ponderosa pine stands dominated. Fire suppression during the twentieth century has resulted in dense stands of mixed conifer and regeneration thickets of ponderosa pine increasing available hiding and thermal cover.

Elk - No presettlement or historic information on elk population numbers or seasonal distribution in the watershed is available. Elk were less common within the analysis area before populations were enhanced by transplanted animals. Annual wildlife reports for the Fremont National Forest from 1926 - 1933 show no elk present on the Forest. Ten elk were reported on the Forest for the period from 1943 - 1945. Prior to 1980, no recreational hunting of elk was allowed in the Interstate unit due to the low population numbers (USFS, 2000).

Pronghorn Antelope - Historically, pronghorn populations were likely higher and more widespread. Pronghorn habitat quality, quantity, and security declined with the onset of heavy grazing in both upland and riparian areas from 1860's through 1945. High deer numbers on sagebrush ranges beginning around 1930 and wildfire suppression leading to juniper encroachment into sagebrush habitats accelerated the decline of preferred pronghorn habitat.

Terrestrial Species Associated with Late /Old Growth Successional (LOS) Habitat

General

The abundance, distribution, connectivity, and quality of suitable habitat for wildlife species associated with LOS forest habitats and associated characteristics was significantly greater during the period prior to 1947 than what exists under current conditions. The forested landscape below 5,500 feet elevation was dominated primarily by a contiguous late/old seral ponderosa pine forest. A lesser area of LOS mixed conifer forest occurred at the higher elevations, predominately above 5,500 feet. Average, maximum, and range of patch sizes were large and most of the patches were of high quality interior habitat relatively unaffected by edge. Large diameter live trees, snags, and down wood were probably more common on average than what currently exists. Late/old seral white fir probably existed only rarely as large area blocks because stands were constantly broken down by insect outbreaks and regenerated by stand replacing fires (USFS, 2000).

Gaps and fragmentation occurred which normally consisted of areas of insect outbreak, burns and natural openings, but overall fragmentation was much less than under current conditions. The contiguous forest matrix facilitated species dispersal, colonization, and genetic interchange throughout the watershed. Species associated with LOS open ponderosa pine conditions were undoubtedly more numerous due to the abundance of suitable habitat. The exceptions may be the pileated woodpecker and American marten, which have benefited from the increase in densities and multi-storied forest.

Northern Goshawk - Goshawks were likely more common in the pine and mixed conifer prior to logging. Nesting habitat conditions were more suitable prior to 1945 when contiguous open LOS forest matrix and interior habitat dominated the forested landscape. The preponderance of open, park-like ponderosa pine LOS forest cover and more area in mature aspen clones provided a greater abundance of and more suitable habitat conditions for goshawk nesting. A greater abundance of prey species associated with LOS forest cover and dead wood would have been present, especially species associated with the high cone production characteristic of open, large tree ponderosa pine forest. The smaller scale horizontal and vertical structural diversity created from natural disturbance within the forested landscape provided diverse habitat for prey species at more of a micro scale than the macro scale regeneration units present today. Habitat security would have been relatively high with lower road densities and less incidence of human use or timber harvest activity (USFS, 2000).

Pileated Woodpecker - Pileated woodpeckers were likely more common in the mixed conifer in the higher elevations of the watershed prior to logging.

Pileated woodpecker habitat prior to 1945 was more extensive and contiguous throughout the watershed, but was probably somewhat less suitable than what presently exists. Forest cover dominated by more open park-like, single story LOS ponderosa pine lacked the structural complexity (down logs, dense canopy, and snags) and densities of the more suitable forest cover (mixed conifer) that provides preferred pileated woodpecker habitat. Highly suitable habitat, however, would have existed above 5,500 feet in areas dominated by mixed conifer where large contiguous blocks of mixed conifer LOS with snag and down wood components intact were likely prevalent (USFS, 2000).

American Marten - The only known historic records of marten on the Fremont National Forest are shown below.

Year	Numbers
1929	300
1939	240
1940-45	300

Marten habitat prior to 1945 was more extensive and contiguous throughout the watershed, particularly in the upper elevations of the watershed, but was less suitable than present conditions. Forest cover dominated by more open park-like, single story LOS ponderosa pine lacked the structural complexity (down logs, multi-storied canopy, and snags) and moist site conditions that provide preferred marten habitat. Also, habitat conditions for prey species associated with riparian areas deteriorated significantly between 1870 and 1945 (USFS, 2000).

Black-backed/White-headed Woodpecker - Black-backed woodpeckers were likely more common in the mixed conifer in the higher elevations of the watershed. There is no information available on black-backed or white-headed woodpecker for lands within the watershed for the period prior to 1945. Habitat conditions for black-backed and white-headed woodpeckers were likely less suitable at the turn of the century than those that existed 50 years ago and still exist today. The lack of large blocks of mature coniferous forest would have created marginal home ranges for this species on a long-term basis. The more prevalent, younger pine and mixed conifer stands lacked the snag and down wood densities characteristic of older stands present today. However, periodic large fires, disease or insect infestations that swept through stands of ponderosa pine and mixed conifer would have created ideal short-term foraging conditions. Distribution and abundance of these birds would have shifted relatively often in response to these events. The single story, parklike LOS ponderosa pine stands that dominated the landscape provided suitable habitat except snag habitat was less prevalent due to the healthier forest conditions. Populations of black-backs were probably smaller in numbers, more stable, and less irruptive than what currently exist (USFS, 2000).

Terrestrial Species Associated with Sagebrush Steppe Habitat

General

Historically, the Gerber and Willow Valley watersheds likely had substantially more acres considered sagebrush steppe habitat. The ratio of low sagebrush to big sagebrush dominated habitats was probably close to current conditions as past habitat alterations to both types have been similar. Big sage stringers containing deeper soil characteristics have been heavily infiltrated by western juniper since fire suppression. Low sage plateaus typically having shallower soil and more rock have also experienced juniper encroachment, but large juniper-free areas still exist.

Sagebrush habitat within the analysis area probably contained some western juniper and/or ponderosa pine clumps or stringers prior to European settlement. However, the natural fire regime likely excluded extensive juniper or pine encroachment. Native forbs and grasses were more diverse and abundant as a component of healthy sage habitat prior to the intensive grazing that came with settlement. These large expanses of sagebrush steppe habitat probably provided for healthy and stable populations of sage obligate species other than the two discussed below.

Western Sage Grouse - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Sage grouse population densities have fluctuated throughout history, depending on many variables. The only historic grouse information available for the Fremont National Forest is for the period 1938 through 1941 when 400 - 1,600 grouse were estimated to occur on the Forest. No other information on historic sage grouse distribution or lek location is available for the watersheds.

Sage grouse habitat quality, quantity, and security declined with the onset of heavy grazing in both upland and riparian areas from 1860's through 1945. High deer numbers on sagebrush ranges beginning around 1930 and wildfire suppression leading to juniper encroachment into sagebrush habitats accelerated the decline of preferred grouse habitat.

Pygmy Rabbit - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Pygmy rabbits were historically restricted to the northern parts of the Great Basin. Generally its range largely coincides with withy that of Great Basin or big sagebrush (Csuti et al, 1997).

Prior to loss of favorable habitat to agriculture, over-grazing, noxious weeds, roads and cleared areas, this rabbit was likely widespread in suitable areas. Like any rabbit, the historic populations of pygmy rabbits were subject to major fluctuations for multiple natural reasons.

Terrestrial Species Associated with Aspen/Riparian Habitat

Aspen in varying age classes was likely more common along riparian areas prior to the onset of livestock grazing and the exclusion of fires. No historical information is available on the occurrence of aspen forest over the landscape. However, it can be speculated that with more frequent, low intensity and larger, high intensity wildfires, lower coniferous stand densities, and higher water tables along riparian areas, the abundance, distribution and successful regeneration of aspen clones was likely greater prior to the era of fire suppression, heavy livestock grazing and high deer numbers during the first half of this century (USFS, 2000).

Red-naped/Red-breasted Sapsucker - More aspen in a diversity of age classes and distribution over a larger area would have provided more available and suitable habitat conditions for aspen associated wildlife species, including the red-naped and red-breasted sapsuckers. As aspen distribution decreased across the landscape, populations and distributions of aspen associated species also declined.

American Beaver - No assessment of beaver populations prior to 1935 is available; however, beaver were undoubtedly more plentiful prior to Euro-American settlement. Fur trapping in the 18th and 19th centuries decimated beaver populations throughout the west. The effects of heavy livestock grazing from 1870 to 1945 and later fire suppression on riparian deciduous vegetation adversely affected the quality and quantity of beaver habitat.

Other Terrestrial Species

No non-game or Neotropical migrant landbird species assessments are available for the period prior to 1945. However, wildlife species dependent on sagebrush stands with a diverse grass and forb understory, riparian area dependent species, and species favoring open, park-like stands of ponderosa pine undoubtedly had more suitable habitat conditions prior to Euro-American settlement and eventual introduction of livestock grazing and suppression of fire.

Herptiles - Historic reptile and amphibian populations were probably more stable and robust. Habitat degradation, exotic species introductions and harvest are some of the factors that have effected herptile populations since Euro-American settlement. Healthy riparian zones adjacent to aquatic systems without introduced predatory fish and bullfrogs probably contained a higher diversity and larger populations of herptiles

Osprey - Osprey were likely uncommon in the watersheds area because of the lack of open, fish-bearing habitat prior to the construction of the numerous reservoirs in the area. Lower Miller Creek and perennial areas of Barnes Valley Creek may have historically had adequate foraging opportunities for osprey.

Landbirds – Since the golden-crowned kinglet, pine siskin, and pygmy nuthatch favor larger ponderosa pine and ponderosa pine snags, they were likely more abundant prior to settlement versus current conditions. The olive-sided flycatcher, which favors mixed conifer edges and burned areas, were likely also more abundant. Species associated with native perennial grasses like the Vesper sparrow, lark sparrow, horned lark, and western meadowlark were probably more abundant prior to fire suppression and excessive livestock grazing.

Historic shrub communities dominated by mountain mahogany and bitterbrush likely supported species including the green-tailed towhee. Sagebrush obligate song birds including Brewer's sparrow and sage thrasher were likely widespread in healthy sage habitats.

Lark sparrows tend to be associated with habitats where there is an interspersion of shrubs and juniper. Gray flycatchers and associated with shrubs and mature juniper. It is possible that these two species are as successful today as they were under reference conditions. Bird species dependent on riparian vegetation like willow flycatcher, orange-crowned warbler, calliope hummingbird, yellow warbler, MacGillivray's warbler, black-headed grosbeak, song sparrow, and Lincoln's sparrow probably suffered with the decline of properly functioning riparian habitat.

IV. Human Uses

Prehistory

The Gerber/Willow Valley watershed lies within the territory of the Modoc Indian Tribelet called *Kokiwas'*, literally, "people of the far out country" (Ray, 1963). These Penution speakers practiced a semi-sedentary lifeway following a "seasonal round" of hunting and gathering. Thus they migrated to various locales as food resources became available in the warm months and lived in permanent village settlements during the cold months (Ray, 1963). Today remnants of their occupation abound, especially around water resources. Evidence of occupation appears in the form of rock features (i.e. rock rings [Figure 4-2], rock alignments, bedrock mortars, rock cairns [Figure 4-3]), rock art, and lithic scatters (concentrations of flaked stone debris and tools).

Modoc ethnographic accounts describe a politically egalitarian society. Their material culture was characterized by mat or earth covered semi-subterranean winter lodges, twined baskets, and food processing implements such as monos, metates, mortars and pestles. They hunted with bow-and-arrow technology, and harvested fish with dip nets, fish spears, fish hooks, and traps (Ray, 1963).

Their diet relied heavily on roots and grass seeds (Silvermoon, 1994). Before the construction of Gerber Dam, Modocs were drawn to the area known today as Gerber Reservoir. The reservoir was once a vast wet meadow supporting abundant camas (*Camassia quamash*) crops. In forest openings and rocky areas they gathered epos or ipos (*Perideridia sp.*) (Cannon 1984, 1985; Ray 1963). Mr. and Mrs. Orval and Bee DeVaul remembered Modoc elders digging epos and hunting "yellow tailed" marmots until the 1940's in the Barnes Valley area during an interview in 1992 (Sobel et al, 1992). In late summer/early fall, they gathered seeds from tarweed (*Madia glomerata*), and balsam root (*Balsamorhiza sagittata*) by beating the plants with a tennis racket-shaped basket (Ray, 1963).

Figure 4-2. Example of a rock ring feature.

Figure 4-3. Example of a rock cairn.

Fishing, hunting, and berry gathering supplemented their diet. They fished for shortnose suckers (*Chasmistes brevirostris*) at spawning times, trout (*Salmonidae sp.)* chubs (*Gila sp.*), various minnows, lampreys (*Lampetra tridentatas*), and collected freshwater shellfish (Ray, 1963). They hunted big game, such as mule deer (*Odocoileus hemionus*) and coyote (C*anus latrans*), and small game, such as rabbits (*Lepus sp.* and *Sylvilasus sp.*) and squirrels (*Spermophilus sp.*). They also gathered serviceberries (*Ribes sp.*), western chokecherry (*Prunus virginiana*), and blue elderberry (*Sambucus sp.*) (Ray, 1963).

The Modoc world view stressed interdependency between humans and the natural world. Humans were instruments of the spirits. Only shamans could wield spirit power, but prayer played a significant role in the Modoc religion. Sweat lodges served as prayer alters (Ray, 1963). They also practiced "vision questing". Ray (1963) noted that a vision quest or crisis quest was sought during commemorative events or life crises. He wrote that,

"certain crises in the life of the individual were occasions for observance of a quest involving fasting, isolation, strenuous artificial activities, and ritual bathing…..The basic ritual pattern was identical for all….The framework of the ritual was a quest in which the individual wandered about the woods and hills in areas isolated from human settlements. That which was sought in the quest was a prophetic and satisfying dream....[During this time] rocks were piled in a typical manner: a large one at the base, a somewhat smaller one surmounting that, continuing thus until the pile was as high as could be built."

Rock cairns, the physical embodiment and remains of a vision quest, are today found throughout the watershed. The Modoc also practiced cremation of their dead. Yainax Butte located along the northwestern boundary of the Gerber/Willow Valley watershed is religiously significant to the Klamath Tribes (personal communication, Gerald Skelton 2002). Ray notes that there was a Modoc summer village, named *Ya'inaks*, near Keno Springs, south of Yainax Butte, "where ceremonial and gambling activities took place" (Ray, 1963).

History

Early Euro-American explorers never explored Gerber/Willow Valley because, as Beckham wrote, it "lay beyond primary routes of travel and exploration" (2000). The 1846 Fremont Expedition and the Williamson-Abbot Expedition of 1855 traveled past the watershed to the west (Gates 1982). However, Beckham notes that a band of "free trappers", led by Old Bill Williams, explored the Lost River region in 1843. Williams' group confronted the Modocs in a skirmish at a spring someplace east of Langell Valley (Beckham, 2000).

By the end of the 19th century, Oregon's exploration era had come to an end and intense settlement spurred on by the Homestead Act of 1862 had commenced. The Modocs, along with the Klamath and Yahooskin Band of Snake Indians, ceded their lands to the United States in 1864. However, according to land claim records, Euro-Americans didn't settle the area until 1875 (Beckham, 2000). Before settlement, a few traveled through the area via early emigrant routs such as the Applegate Trail of 1846.

Commissioned by the South Road Company, the Applegate brothers, Lindsay and Jesse, and Levi Scott blazed the Applegate emigrant trail from Willamette Valley, Oregon Territory, to the California-Truckee road in northwestern Nevada. On the way the trail crossed just north of Clear Lake just within the southern boundary of the Gerber/Willow Valley watershed. In the first year, 90-100 wagons followed the Applegate Trail to Oregon. Over the next 10 years the trail was rarely used and finally abandoned shortly after 1855 (Gates, 1982).

Before the Applegate Trail was abandoned, it was patrolled by organized volunteers and Army troops to assure the safety of emigrants from Indian attacks. Little fighting took place prior to 1852 when, as Gates (1982) wrote, "the Modocs, alarmed at the growing encroachment on their land, decided it was time to stop the flow of emigrants." The events that followed set the stage for the future Modoc War that started November 29, 1872. The war ended with the capture of the Modoc leader, Captain Jack, on June 1, 1873 at Willow Creek, east of Clear Lake and just south of the southern boundary of the Gerber/Willow Valley Watershed. Before his capture, Captain Jack lead his pursuers from Clear Lake, California, north into Langell Valley, Oregon (within the watershed area), and finally back to California (Gates, 1982). The Modocs who survived the war were shipped to exile, first to Wyoming, then Nebraska, then Kansas, and finally Oklahoma. The Modocs that did not participate in the war remained on the Klamath Reservation (Adkison, 1998).

By the turn of the 20th century, the new way of life brought by the Euro-American settlers was well entrenched and had brought significant changes to the Gerber/Willow Valley watershed landscape. The economic welfare of the settlers revolved around livestock grazing (i.e. sheep and cattle), thus the area was developed for ranching.

Evidence of historic sheep herding is present in aspen groves throughout California, Nevada, and Southern Oregon such as Tamarack Spring in the Gerber/Willow Valley watershed. From the 1860s to the early 1970s, Basque sheepherders carved arborglyphs or tree carvings into the soft bark of aspen trees. The Basque were emigrants from the western Pyrenees Mountains between Spain and France (Mallea-Olaetxe, 2000)

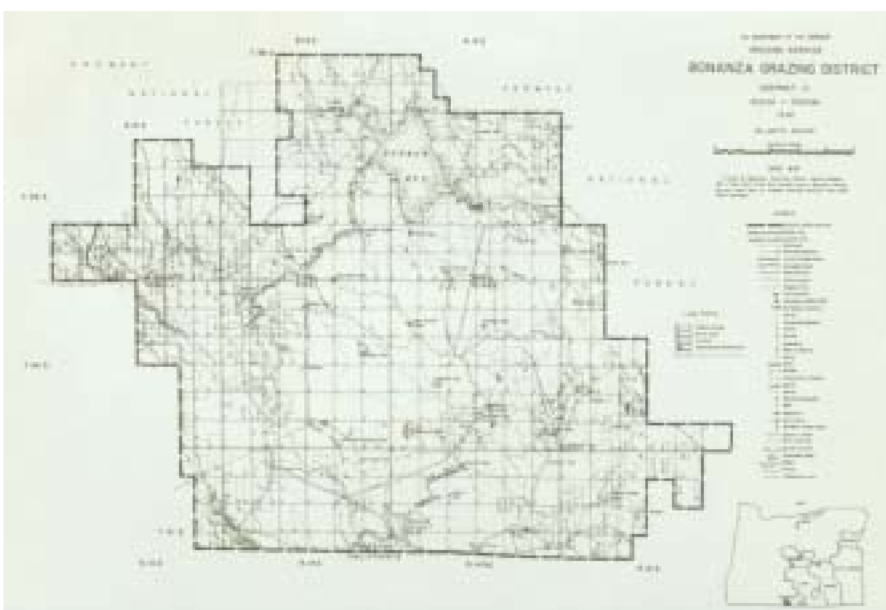
By 1935, the Gerber family, the first to establish a ranch in the Gerber Reservoir area in 1880, grazed 1,200 cattle (Beckham, 2000). Another early settler, Jesse Carr established a ranch in the area of Clear Lake in

1875. Adkison, 1998) wrote that *"by the time of his death in 1903, Carr had amassed a holding of 35,000 acres.....Carr hired* Chinese laborers who ..... constructed a stone wall encompassing 90,000 acres of public domain and other grazing land around Clear Lake." This includes the southern portion of the Gerber/Willow Valley watershed below the stateline. According to Gerald Gates, Modoc Forest Archaeologist, Carr's Wall is the largest enclosed feature in the state of California (personal communication, 2003).

In the beginning, grazing practices consisted of annually allowing livestock to roam free on public domain lands and essentially fend for themselves. The burden on public domain lands mounted and tensions between cattlemen and sheep raisers grew into range wars (Bach, 1981). On occasion, the conflicts lead to bloodshed. On April 20, 1918, cattle drovers murdered sheepman O.T. McKendrie at Dry Prairie (Beckham, 2000). The need for land management began to be recognized. The Fremont Forest Reserve was established September 17, 1906 by proclamation signed by President Theodore Roosevelt (Bach, 1981). The Modoc Forest Reserve was created in 1904 (Adkison, 1998). In addition, thanks to local residents concerned about rangeland health, the first grazing district in Oregon and the United States was established for the area in 1934, under the 1933 Taylor Grazing Act (Figure 4-4) (Beckham, 1984).

In 1946, Congress merged the Grazing Service with the General Land Office to form the Bureau of Land Management (BLM). Since then the BLM has managed 112,000 acres of public lands in the Gerber/Willow Valley watershed (Beckham, 2000). Like the Forest Service, the BLM manages the land for multiple uses, including timber harvest. A few locals dabbled in commercial logging in the early 1900s. The Noble family established a saw mill on Goodlow Mountain in 1927 which was later moved to Barnes Valley where it ultimately burned in the 1930s (Beckham, 2000).

Figure 4-4. Bonanza Grazing District map.



Additional land changes came in 1925 when the Bureau of Reclamation built the Gerber Dam on Miller Creek as part of the Klamath Project (Figure 4-5). The subsequent reservoir became known as Gerber Reservoir (Beckham, 2000). Other land improvements (i.e. roads, spring developments, bridges, telephone lines, fences, stock ponds, corrals) existing today were built by the Civilian Conservation Corps (CCC) in the 1930s. The CCC established a camp in Langell Valley called Camp Bonanza. Camp Bonanza managed projects conducted in the Gerber/Willow Valley watershed area (Beckham, 2000).

Figure 4-5. Construction of Gerber Dam.

The interesting history of the Gerber/Willow Valley watershed came to a climax in World War II, when the Navy selected the area for a gunnery range under the War Powers Act of 1943 (Beckham, 2000). For instance, targets were erected in various places within the watershed (including islands within Gerber Reservoir) and fighter pilots training for combat would practice their shooting skills. Practice bombs and 50mm casings continue to turn up during archaeological surveys.

Today the Gerber/Willow Valley watershed area continues to be a rural setting with emphasis on livestock ranching, limited farming, and commercial logging.

STEP 5. SYNTHESIS AND INTERPRETATION

The purpose of Step 5 is to compare current and reference conditions of specific ecosystem elements and to explain significant differences, similarities, or trends - and their causes. Information from the previous four steps is interpreted. The interactions of biological, physical and social processes are explained. The capability of the system to achieve management objects is discussed.

I. Watershed and Aquatics

Uplands/Soils

The WEPP erosion estimates and the infiltration test (Table 4-1) show that water in the forest is apt to runoff rather than recharge the soils, which enhances erosion risk. Gerber's dense and mid-seral forest areas are apt to be the principal erosion source areas as opposed to late and PNC rangelands. This is contrary to the "effective precipitation" erosion model that was identified prior to the decline in forest ground cover (Biswell, 1989, Debano et al 1998, Satterlund, 1972). Probably the most telling and useful forest structure number comes from Aldo Leopold's big game observation in the 1930's. For elk habitat 60 percent opening and 40 percent forest cover was the optimum observed by Aldo Leopold and researched forty years later by Thomas (1998). It is instructive to learn that 60 percent opening were common habitat conditions in moist, rocky mountain forests. Similarly in the Sierra Nevada, Church (1912) identifies open honeycomb forest structure in Sierra Nevada in snow surveys in the early 1900's. In Gerber's semiarid habitats, 70 to 80 percent opening and 30 to 20 percent tree cover may characterize the historic erosion limiting stand structure for single-story LOS (Late/Old Structure) in the Ponderosa Pine and Pine Associated types.

The local opportunity or problem to balance forest overstory and understory for erosion control and humus conservation is part of a larger forest conservation issue. With the advent of extensive fire control in the 1920's forest understory vegetation began to decline. In an extensive photographic essay of historic vistas, Gruell (2001) shows the extensive decline in open forest structure and well-developed understory vegetation growth in the Sierra Nevada that is problematic in the entire eastside pine zone. Now rather then sustaining a beneficial open structure, wildfires have become lethal as western forests became thickets. In the recent past, a few percent of high intensity burn area was common in a wildfire report, now it is common to report a wildfire emergency with 30 percent or more high intensity burn.

Altered forest habitats are one of the unintended consequences of fire control that yields regional losses of forest savanna and meadow habitats (Gruell, 2001). Forest ecological sites in the Gerber catchment are generally overstocked, so erosion risk is great. Forest habitats are composed of two forest structures the older and larger multiple-limbed ponderosa pines grass savanna and a younger fir and pine thicket, which have displaced the grass savanna vegetation. As overstocked forest without well-developed ground vegetation and natural forest openings, the most common forest condition classes are mid condition.

Forest sites lack shrubs and grasses identified in Hopkins' (1979) plant association guide and the ecological sites by the Natural Resource Conservation Service with the Bureau of Land Management, Klamath Resource (Soil Survey Staff, 2002). After forest fires, there is often a grass then shrub relay (Biswell, 1989, Debano et al 1998), so shrubs are considered later seral. The current prescribed under burns shifted the undergrowth composition to grass. Yet current grass composition is out of balance. Within the forest there is a lack of Idaho fescue, *Festuca idahoensis*, which is indicative of ineffective snow catch. So from a soil erosion and catchment point of view the grass composition and cover after the under burns indicate decline in soil water functions—the forest openings are too small to support the Idaho fescue, a key part of the ecological sites.

In eastside semiarid forest, openings with well developed under growth sustain the desired high infiltration rates and spongy humus, which is a recurring goal in forest conservation (Rawley, 1994). And with a full complement of plants forestland and rangelands are absorbent wildlands with rough surfaces that slow and catch sediment.

On the other hand rangelands identified in individual soil map units have recovered from consumptive uses of the early 1900's. The majority rangeland sites (17 of 20 sites) and rangeland areas have high or late seral rangeland vegetation cover and composition.

Transects across Gerber's low sagebrush and western Juniper rangeland show abundant sod binding plants. Among the rock garden, there is an ample cover of grasses such as Idaho fescue, Sandberg bluegrass, Blue bunch wheatgrass and Onespike oatgrass. The biological production and diversity is evident in early spring with a profuse mix of forbs: *Agoseris* sp, cinquefoil, bighead clover, lupine, penstemon, and Yampa.

Generally the northerly ecological sites in the Gerber drainage with frigid soil temperatures and snowfall of 16 to 20 inch precipitation have well developed vegetation for soil catchments. Yet in the mesic soil temperature zone southwest of Duncan Spring that drains in to Lost River, grass cover diminishes from ample to acceptable cover of mid condition classes. But at the California state line grass cover recovers for late condition classes to the south; the contrast in Idaho fescue abundance across the state line fence is eye catching.

Two grasses are associated with key parts of the soil climate and erosion processes in Gerber watershed. Idaho fescue (*Festuca idahoensis*) abundance is associated with effective snow catch, which enhances coldwater recharge and limits erosion. Onespike oatgrass (*Danthonia unispicata*) abundance is associated with vernal pools and heavy clay soils. These shallow clay soils act as seasonal wetlands that are recharged to saturation by snow melt water then drain as the growing season progresses. Abundant moss and lichen cover aids the seasonal wetland nutrient dynamics. So with the re-establishment of sod plants, such as fescue and oatgrass, wind and water erosion rates are apt to be minimal.

Generally the Juniper woodland rangeland ecological sites are too open to carry a crown fire. Yet the warmer mesic sites have had a few historic crown fires—such as the Bump Head from a Civilian Conservation Corp campfire. So erosion rates in the rangeland and woodlands are apt to be associated with low intensity ground fires. And with heavy clay soils, post fire hydrophobicity (water resistant soils) are apt to be minimal (Debano et al., 1998).

Compaction

Local opportunity or problem to balance forest overstory and understory for compaction recovery is part of a larger forest conservation issue. With the advent of extensive fire control in the 1920's forest understory vegetation began to decline, which slows ground cover based soil recover processes. With the recovery of shrubs and grasses identified in Hopkins' (1979) plant association guide and the ecological sites by the Natural Resource Conservation Service with the Bureau of Land Management, Klamath Resource (Soil Survey Staff, 2002), the compaction recovery after harvest is apt to be timely. Shrink-swell clay soils have a self-plowing recovery with wetting that improves the recovery rate from traffic or compaction. So grass ground cover and shrink-swell clay mineralogy contribute to native site recovery in these forest soils.

Currently the compaction condition is moderate using a landscape example with a data distribution estimate and a conservative high/low estimate with finding values of 2% or14%, which are less than the 20 percent index in Forest policy (Forest Service, 1998).

Compaction effects on soil-plant-water relations may be less in the future than in the past, with traffic effects with the movement to low ground pressure logging equipment and seasonal controls to limit optimum compaction mechanics. Forest cultivation as thinning from below for a historic large tree structure facilitates the grass ground. As historic forest communities are reestablished the fescue and oatgrass growth and residue cover are apt to be indices of soil structure recovery that is growing out of the plates as in croplands (Lamarca, 1996).

Hydrology

The effects of land management activities on watershed processes are complex and interactive. The spatial distribution of management activities varies, as does the timing and intensity of specific actions, making it difficult to determine the specific cause of observed or inferred changes in hydrologic or fluvial processes. That said, resource managers and scientists have documented the typical effects of common land management activities and the factors that either enhance or mitigate those effects. That information, when compared to current and past land use in the analysis area, provides insight into the “trajectory” of watershed and the processes.

Grazing

The hydrologic impacts of grazing are related primarily to the infiltration and runoff components of the basin water budget. Livestock grazing affects watershed properties by alteration of plant cover and by soil compaction from the physical action of animal hooves. Reductions in vegetation cover and litter may increase the impact of raindrops, decrease soil organic matter content, destroy soil aggregates, and increase the extent of surface crusts. These effects may, in turn, decrease water infiltration rates.

At present, there is likely a larger percentage of the watershed exposed as bare soil than existed prior to Euro-American settlement. This is a result of the combined effects of historic range management, juniper encroachment, and ongoing livestock grazing. Large areas of BLM-administered land (those areas with low precipitation and shallow soils) probably had extensive bare ground historically. The role of biotic crusts was especially important in such areas. Bare ground may be increasing in areas that are currently experiencing juniper encroachment.

As infiltration rates decrease, precipitation or snowmelt that previously might have entered the soil is transported instead as overland flow, or runoff. This may cause larger flood discharges, because soil storage is not accessible to absorb some of the water volume. Conversely, because not as much water is being stored in and gradually released from soils, summer low flows may be reduced.

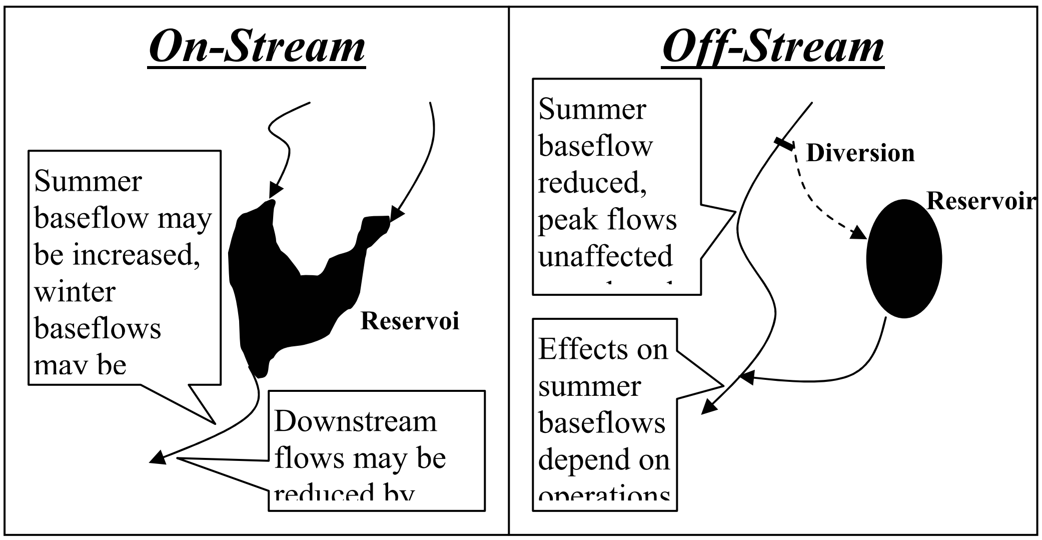
Increased runoff can increase upland sheet and rill erosion rates, resulting in increased sediment delivery to streams. Increased peak runoff can also increase stream energy available for bank erosion and channel incision. The latter may lead to gully formation. These effects are amplified when riparian zones and wetlands have been heavily grazed or altered in such a way that they no longer provide “hydraulic roughness” (such as resilient bank vegetation, woody debris, or channel plan-form complexity) to decrease the energy of floods.

Diversions and Impoundments

Depending on how and when they are operated, streamflow diversions can have the effect of decreasing flood magnitudes, decreasing summer low flows, or both. If diversions transfer flow to other streams, rather than to reservoirs, the opposite effects may occur in the receiving streams. Diversions that decrease peak flows may reduce soil recharge in riparian areas (due to decreased floodplain inundation), causing an indirect reduction of summer low flows. In general, diversions of the type occurring in the analysis area have a greater effect on moderate and low flows, and a relatively minor effect on large peak flows.

The two general types of impoundments (on-stream and off-stream) have different impacts on streamflow patterns (Figure 5-1). Because they are designed to store flows during the wet season and release flows during the dry season, on-stream reservoirs can decrease flood peaks and winter flows. During the irrigation season, on the other hand, reservoir releases can cause summer flows to be artificially high for sustained periods, especially when an off-stream reservoir is releasing water into a basin other than that tributary to it. Due to evaporation losses from reservoir and stock pond water surfaces, impoundments cause basin water yield to be reduced even if all stored water is released (Reid, 1993). The effects of flow reductions may be mitigated in some streams by contributions from springs, groundwater seepage, dam seepage, or tributaries (Williams and Wolman, 1984).

Figure 5-1. General effects of two types of impoundments on streamflow.



Forest management

Logging practices and forest management objectives vary by landowner and have changed over time. In the past, clear-cut logging and selective removal of the largest trees was common. Recently, management of forests on public lands has focused on meeting multiple resource objectives and restoring altered stand conditions. The effects of clear-cut logging were likely to increase early winter peak flows and the magnitude of rain-on-snow events. As clear-cut areas have recovered these impacts have been reduced.

Dense stands have resulted from fire suppression and a lack of density management in young and middle age stands (see *Vegetation – Forested Uplands* section). These stands transpire more water than more open stands, and the lack of understory grasses reduces infiltration rates. While the stand structure and composition may not be affecting peak flows, these stands are causing reductions in water yield.

Water use can be estimated using surface area calculations, since evaporation and transpiration ("ET") water consumption varies with surface area. For easy comparison between grass cover and conifer cover surface, it is assumed that a circle represents an area of grass and a cone represents a conifer.

Surface area of a circle = (Π) (radius) (radius)

Surface area of a cone = (Π) (radius) (slope length)

The difference in surface areas between a cone and a circle is the ratio of "slope length /radius." For a mid size conifer with a 15-foot radius and 60-foot sloping height to treetop the slope length /radius ratio equals 4. This 4 to 1 potential ET ratio shows why tree density has such a great effect on water use.

Relative water use by trees and grass can be estimated by comparing the proportions of "cone" and "circle" surface areas across a given area. An acre can hold 49 cells composed of 15-foot radius tree cones or grass circles. In historic condition with 60 percent opening and 40 percent tree cover (Thomas, 1998), 20 of the 49 cells would have tree ET cones in an acre. In Fremont National Forest stands with historic single-story LOS (Late/Old Structure) of old growth, Hopkin's (1979) identifies 14 large trees per acre, which is about 30 percent tree cover, or 14 of the 49 cells. In semiarid habitats such as portions of the analysis area, 20 to 30 percent tree cover with well-developed ground cover may have characterized forest habitats.

Currently, the historic proportion is reversed for 80 percent tree cover for a 20/80 ratio in some areas (the causes of this are discussed in the *Vegetation* sections). As stand densities increase, the surface area of vegetation (the surrogate measure of ET) increases. For many stands, there is 1.5 to 2 times more vegetation surface area currently than there was historically. The following table illustrates estimated vegetation surface area ("Evaporation/Transpiration surface units") for areas with varying ratios of grass and trees.

% Grass	% Trees	ET Surface Units
80	20	76
70	30	94
60	40	109
20	80	166

Regardless of the exact ratio, it is very likely that stands converted from LOS conditions to dense young forest conditions are experiencing higher ET rates.

With the addition of white fir among the pines in Ponderosa Pine and Pine Associated types within historic single-story LOS (Late/Old Structure) evaporation has a dramatic increase. Unlike Ponderosa Pine, which is able to effectively regulate water use, white fir has needles with little water regulation capability (Smith, 1985). White fir has higher rates of soil moisture depletion than montane pines (Royce and Barbour, 2001). As a result, increased white fir abundance causes transpiration rates in excess of historic values, even during dry periods. The reduced extent of forest openings in many areas also affects snow accumulation (these processes are discussed in *Step 3 – Hydrology*). These changes have accentuated the impacts of increased tree abundance on water availability.

Roads

Because they are extensive impervious surfaces, roads can impact the routing of water from hillslopes to streams, and may cause peak flows to increase. In order to increase peak flows, roads must be hydrologically connected to the stream network. Road systems can extend the drainage network directly, via the road surface and ditch lines (Harr et al., 1975), and indirectly, via the incision of channels downslope from culvert outlets (Montgomery, 1994) and other drain points (such as waterbars). Road construction may require slope excavation, which can result in the concentration of subsurface flows on the road surface, further enhancing drainage network extension (Harr et al., 1975). Riparian roads quickly deliver precipitation inputs and intercepted subsurface flows to adjacent waterbodies.

Juniper encroachment

<u>General Effects</u> - The physiological characteristics of individual juniper trees and the structural characteristics of juniper stands may cause decreased basin water yield, decreased soil surface cover, and decreased infiltration. The onset and rate of transpiration in juniper stands may be early and high, especially relative to other plant communities that could potentially occupy sites that are presently juniper-dominated. Additionally, fast growth rates, dense canopies, and extensive root systems allow juniper to efficiently intercept precipitation and compete for light and nutrients (Eddleman and Miller, 1991).

In concert with grazing, the competitive superiority of closed canopy juniper stands may result in a decline in understory vigor (Miller et al., 1999). If vegetation cover and organic litter production are reduced, precipitation reaching the ground surface may be less likely to infiltrate and more likely to generate runoff. This, in turn, may cause soil erosion and decreased soil water storage. Together, increased runoff and decreased soil water storage capacity can lead to decreased groundwater recharge and decreased water yield (Eddleman and Miller, 1991).

Annual water use by transpiration of juniper depends on water availability and site characteristics (elevation, soil properties, tree sizes, number of trees, etc.). Water use in western juniper is limited during the late summer due to low soil moistures and in winter due to low air and soil temperatures. Research measuring actual water use by juniper shows that water use is variable, but is in the general ranges of 4 to 10 inches annually and 0.5 to 1.5 inches from November through March (Table 5-1). The values presented by Angell and Miller (1994) are likely the most applicable to the analysis area due to the nearby study location and similarities in climate and stand structure. However, their study area has lower annual precipitation and these values may be underestimated for the Gerber/Willow Valley area.

Table 5-1. Measured transpiration in juniper communities.

Authors	Species and State	Annual (inches)	Dormant Season (inches)
Angell and Miller, 1994	Western Juniper, Eastern OR	5.6	0.4
Leffler et al., 2002	Utah Juniper, UT	5.0 – 7.8	1.5
Lane and Barnes, 1986	Pinyon-Juniper, AZ	2.7 - 14.2	1.8

Potential Effects of Juniper Encroachment in the Analysis Area - A review of ESI data collected for BLM-administered lands suggests that the number of juniper trees per acre has increased (Table 5-2). These increases are evident for the six dominant ecological types (that account for 88% of BLM-administered lands) as well as for the ecologically important Shrubby Loam ecological type.

The table was developed by summarizing Ecological Site Inventory data for BLM-administered land in the analysis area. During ESI field inventories, abundance of various size classes (such as “0 to 3 feet”, 3 to 6 feet”, etc.) of juniper trees was estimated using categories (such as “0 to 5 trees”, “5 to 10 trees”, etc.). The “trees per acre” values in this table were calculated by assuming a mid-range value for abundance (e.g., 2.5 trees, 7.5 trees, etc.), then summing those mid-range values for the two size classes (<12 feet and >12 feet).

Synthesis of precipitation, soils, and vegetation data suggests that juniper encroachment (and subsequent increases in interception and dormant season transpiration) does indeed affect the availability of water for use by other plants, groundwater recharge, or streamflow. Tables 5-3 and 5-4 summarize these relationships for major vegetation types and soil series.

In general, juniper uses a substantial portion of annual average precipitation across large areas of BLM-administered land and thereby affects water available for other resources. As shown in Table 5-4, the magnitude of water use by juniper is variable, primarily as a result of varying degrees of encroachment in different ecological types (and their associated soil series). Water use during the dormant season is lower, but may still affect plant growth and soil recharge. Juniper also uses water during April, which is the period when other plants are just beginning to break dormancy.

Table 5-2. Number of old growth and non-old growth (encroaching) juniper trees per acre, by ecological type and condition class.

Ecological Type (number of samples)	Number of old growth JUOC trees per acre (range)	Height category	Condition Class							
			PNC		Late		Mid		Early	
			Average # of non-old growth JUOC per acre (range)	Number of samples	Average # of non-old growth JUOC per acre (range)	Number of samples	Average # of non-old growth JUOC per acre (range)	Number of samples	Average # of non-old growth JUOC per acre (range)	Number of samples
Shrubby Loam 16-20” (6)	1 (0-5)	<12’			16 (8-25)	6				
		>12’			25 (5-65)					
Pine-Mahogany-Fescue 16-20” (15)	2 (0-5)	<12’	18	1	17 (8-23)	13	28	1		
		>12’	28		25 (5-40)		15			
Stony Claypan 14-20” (17)	<1 (0-5)	<12’	2 (0-8)	9	6 (0-13)	8				
		>12’	2 (0-8)		1 (0-5)					
Juniper Claypan 16-20” (24)	7 (0-30)	<12’	15 (8-35)	14	13 (8-23)	8	13 (8-18)	2		
		>12’	17 (5-28)		18 (5-28)		13 (10-15)			
Juniper Claypan 12-16” (15)	8 (0-30)	<12’	11 (8-13)	3	18 (8-30)	5	27 (13-68)	5	19 (8-30)	2
		>12’	22 (10-40)		13 (3-28)		27 (15-40)		21 (15-28)	
Shallow Stony 10-20” (27)	1 (0-5)	<12’	0	3	5 (0-18)	22	15 (13-18)	2		
		>12’	0		1 (0-5)		10 (5-15)			
Pine-Sedge-Fescue 16-24” (19)	<1 (0-5)	<12’			10 (0-30)	10	6 (0-13)	9		
		>12’			8 (0-28)		6 (0-15)			

Table 5-3. Characteristics of major soils series on BLM-administered lands.

ESI Soil Series	Association with major ecological types	Surface texture	Depth of A, B, and C horizons, or *depth (inches) to duripan	ESI average available water capacity
Norcross	Stony claypan (14-20); Juniper claypan (16-20)	V. Cobbly loam	20*	2.9
Devaul	Shrubby loam (16-20)	Cobbly loam	56	8.0
Schnipps	Pine-mahogany-fescue (16-20)	V. Stony loam	49	7.3
Bumpheads	Pine-mahogany-fescue (16-20)	V. Stony loam	34	4.6
Pankeybasin	Stony claypan (14-20)	Loam	23*	2.7
Dranket	Juniper claypan (16-20)	V. Cobbly loam	25*	3.8
Woolencanyon	Juniper claypan (12-16)	V. Stony clay loam	12*	1.8
Notchcorral	Juniper claypan (12-16)	V. Cobbly loam	22*	3.3
Casebeer	Shallow stony (10-20)	V. Cobbly loam	14*	2.2
Wonser	Shallow stony (10-20)	Ex. Cobbly loam	13*	1.7
Benhall	Pine-sedge-fescue (16-24)	Cobbly loam	38	5.4
Mound	Pine-sedge-fescue (16-24)	V. Stony loam	42	5.7

Since it is based on estimates of average annual values, Table 5-4 does not account for interannual climate variability or the variable extent of encroachment in a given ecological type. The relative effects of water use by juniper on the growth of other plants are likely increased in dry years, since juniper can utilize water before other plants (Angell and Miller, 1994).

Table 5-4. Estimated annual water availability and usage for soil series associated with ecological types experiencing juniper encroachment.

ESI Soil Series	ESI Average precipitation (inches)		Dormant season Precip. in Excess of AWC (inches)	Assumed Canopy Interception** (inches)		Assumed Transpiration (inches)***		Water Use by Juniper**** (inches)		% of average annual precip. used by juniper	% of dormant season precip. used by juniper
	Annual	Nov-Mar*		Annual	Nov-Mar*	Annual	Nov-Mar*	Annual	Nov-Mar*		
Norcross	18	10.8	7.9	1.5	1	4	0.3	5.5	1.3	31%	12%
Devaul	18	10.8	2.8	2	1.3	6	0.5	8	1.8	44%	17%
Schnipps	18	10.8	3.5	2	1.3	6	0.5	8	1.8	44%	17%
Bumpheads	18	10.8	6.2	2	1.3	6	0.5	8	1.8	44%	17%
Pankeybasin	18	10.8	8.1	1	0.7	2	0.1	3	0.8	17%	7%
Dranket	18	10.8	7.0	1.5	1	4	0.3	5.5	1.3	31%	12%
Woolencanyon	15	9.0	7.2	1.5	1	4	0.3	5.5	1.3	37%	14%
Notchcorral	15	9.0	5.7	1.5	1	4	0.3	5.5	1.3	37%	14%
Casebeer	18	10.8	8.6	1	0.7	2	0.1	1.7	0.8	9%	7%
Wonser	15	9.0	7.3	1	0.7	2	0.1	3	0.8	20%	9%
Benhall	19	11.4	6.0	1.5	1	6	0.5	7.5	1.5	39%	13%
Mound	19	11.4	5.7	1.5	1	6	0.5	7.5	1.5	39%	13%

Notes: *For the analysis area, the dormant season generally occurs from November through March. Approximately 60 percent of annual precipitation occurs during this period;
**adjusted from Bedell et al, 1993;
***Derived from review of Angell and Miller (1994) and site characteristics in the analysis area;
****sum of canopy intercerption and transpiration. (Based on literature review and ecological surveys of non-old growth juniper.)

Juniper Removal

Studies carries out in the southwestern United States suggest that juniper removal appears to have a marginal affect on basin water yield (Collings and Myrick, 1966; Schmidt, 1987). Treatment effects are highly variable, and depend not only on the type and extent of treatment applied, but on the past, present, and future management of the site. After juniper is removed, the vegetation that remains or becomes re-established following treatment may increase in size, density, or cover and can use up any "savings" realized (Pyke, 1994). Conversely, there is anecdotal information suggesting that flow from springs can increase after removal of juniper around the spring source.

The beneficial impacts of juniper treatment are likely most profound at the scale of hillslopes and small catchments. Recovery of herbaceous plant communities following juniper removal can lead to an increased supply of organic litter, decreased exposure of bare soil, increased infiltration capacity, and decreased runoff generation and erosion potential. The recovery of soil surface cover and infiltration rates following treatment is affected by site-specific factors such as soil texture, slope, aspect, and soil condition.

The methods used to manage juniper can have detrimental effects on watershed processes. If mechanical treatments are employed, the risk of compaction in some areas may be high, especially if cut juniper is gathered and removed. The same can be said for the risk of soil displacement. If cut juniper is burned or otherwise removed, nutrient loss can occur. Shrub and grass communities may be damaged, at least in the short term, by mechanical treatments, gathering, and burning.

Prescribed fire

Through the removal of organic litter and living plants, prescribed fire can directly affect infiltration, interception, and transpiration rates, as well as soil water storage and snow melt processes, and therefore has an indirect effect on runoff rates and water yield. The type and magnitude of fire effects on hydrologic processes depends on the extent and intensity of the burn, proximity of stream channels, soil characteristics, and slope gradient and aspect. The effects of low-severity prescribed fires are likely less profound and less persistent than the effects of large wildfires. The cumulative effects of fire and the effects on burning in riparian areas have not been adequately assessed (DeBano et al., 1996).

In general, short-term increases in runoff and water yield can be expected following fire. Loss of living plants reduces transpiration rates, and the loss of living and dead plant material reduces interception and infiltration. Reduced transpiration demand increases the amount of water stored in the soil, thereby making more water available for groundwater recharge and streamflow (DeBano et al., 1996). Decreased canopy cover following severe fires can lead to decreased canopy snow interception, melt, and sublimation, making snow accumulation more likely. Intense fires can cause hydrophobic (water repellent) organic compounds to develop within soils, thereby decreasing infiltration in sandy soils. The short-term impacts are balanced by improved understory vigor.

In ponderosa pine forests, runoff typically increases following fires, and may remain elevated for two to 15 years, with higher intensity burns having more persistent effects (DeBano et al., 1996). In a study of fire effects in shrub- and grass-dominated areas, Hester and others (1997) found that infiltration rates decreased following prescribed burns in juniper, oak, bunchgrass, and shortgrass sites. This was attributed to loss of organic matter cover, development of impermeable soil crusts as a result of raindrop splash, and development of hydrophobic layers.

In all types of vegetation communities, hillslope transport of sediment and nutrients increases following fire (DeBano et al., 1996; Hester et al., 1997). This is a consequence of decreased ground cover and increased runoff. Minor post-burn increases in nutrient concentrations are due to the movement of nutrients adsorbed to sediment and processes of volatization and nitrification (Gottfried and DeBano, 1988). As with runoff, enhanced sediment and nutrient yields diminish over a relatively short recovery period.

Hillslope soil loss

Upland soils play important roles in storing and releasing infiltrated water. The pore space of soils (the volume between soil particles) can hold water during wet periods and release water during dry periods. Such soil storage is lost when soils are compacted or eroded.

As discussed in elsewhere in regards to soils and watershed processes, those land management activities that affect infiltration rates can also affect surface runoff, which in turn affects erosion rates. In steep portions of the landscape, or where soils are shallow, land management activities may cause substantial soil loss. Soil compaction can occur as a result of roads, skid trails, and concentrated livestock passage. Due to its amorphous structure, organic matter, or humus, has an important role in soil water storage. The loss of soil organic matter, either through grazing or increased stand density (over the long term) or burning can decrease infiltration or water storage.

Recovery rates of soil water storage are variable. Storage lost as a result of erosion may require reestablishment of soil horizons, a long-term proposition, at best, in semi-arid regions. The effects of compaction and organic matter depletion may be felt for many decades. As discussed in the Soils section, recovery from compaction is variable. Reduced utilization in rangelands allows organic matter to accumulate, at rates commensurate with the reduction in use.

Channel and valley floor morphology

Channel cross-section form adjusts to changes in streamflow caused by climatic or anthropogenic alterations to the watershed hydrologic cycle. Altered cross-section form can itself affect hydrologic processes, particularly with regards to channel-floodplain interactions and streamflow-groundwater interactions. The same can be said for altered riparian zones, floodplains, and wetlands, as well as the loss of beaver activity that causes flooding.

Incised, over-widened, or straightened channels may have sufficient cross-sectional area to convey floods that might have otherwise overflowed onto floodplains. As a result, flood energy is concentrated within the stream channel rather than being dissipated across the floodplain, causing further channel widening or incision. Reduced floodplain wetting can create conditions unfavorable for riparian plant communities, such that less bank stabilization, vegetative roughness, and woody debris is available to slow future floods and reduce bank erosion.

In alluvial valley bottoms such as are common in the analysis area, the stream water surface is generally equivalent to the local water table depth. Incised streams may “drain” the water table, thus reducing the amount of water available for slow release as summer baseflow. Channelization of wetlands has a similar effect, as well as the effect of potentially reducing the capability the hydrologic system to dampen flood peaks and recharge soil water storage.

Riparian exclosures and riparian pastures are managed to control the detrimental effects of cattle grazing on riparian vegetation and streambank stability. Other strategies, such as early spring grazing, are also used to limit damage to riparian vegetation. Degraded vegetation communities may respond beneficially to riparian-sensitive management relatively quickly (e.g., Kauffman et al., 2000). Channel response to riparian-sensitive management varies. Exclosed areas tend to have more stable banks but channel properties and watershed processes may limit recovery of pool depth, substrate, and width to depth ratios. Recovery of pool depths may be limited by pool filling caused by upstream sedimentation and by the time required for riparian trees to grow and be recruited into the stream channel. Floods may impair bank stability improvements in areas that are recovering from previous grazing damage (Myers and Swanson, 1996).

Stream Channels

1. Channel Shape and Bank Stability

Effects of Land Management

The current shape of stream channels is a reflection of changes in features and processes that occur at broad scales (riparian vegetation, runoff patterns), small-scale human-caused alterations that affect disproportionately large areas (dams, roads, etc.), or both. Stream networks in the analysis area have incised and widened during the historic period. The proportion of the stream network comprised of narrow, sinuous, deep channels that are well connected to their floodplains has been reduced. The proportion of wide, straight, shallow streams that do not interact with substantial floodplains has increased.

Streams flowing through meadow areas with deep soils were most vulnerable to these adjustments. Because of structural features (bedrock, large boulders) that provide vertical and lateral stability, streams that flow through confined areas have not adjusted as much as have streams that flow through more open settings. The presence of basalt fields under valley-fill sediments appears to have prevented channel incision below five or six feet (and at shallower depths in many locations).

During the historic period, intensive livestock use resulted in decreased bank stability. These impacts were aggravated by other disturbances to stream banks, such as channel realignment at bridges or culverts and tractor yarding in riparian areas. Inadequately designed road-stream crossings can alter channel hydraulics directly (by requiring channel realignment – such as occurred at Rock Creek and Pitch Log Creek) or indirectly (by concentrating flows within culverts or under bridges, rather than allowing peak flows to spread out across floodplains). Bank stability in stream reaches that are seasonally inundated under reservoirs is reduced due to the limited amount of vegetation that can grow in such conditions.

Livestock grazing and other management activities occurring throughout this period also affected watershed hydrologic processes in ways that led to increased peak flows that had greater potential to erode stream banks. When vegetation is lacking along an E stream type, lateral (bank) and vertical (downcutting) erosion may lead to progressive stages of channel adjustment, resulting in altered channel dimension, pattern, and profile. As a result of the bank erosion and downcutting, the channel becomes wider and shallower, resulting in a higher width/depth ratio (a conversion from an E to C stream type). During downcutting events, the channel becomes an incised gully, straighter and steeper than the original channel—a G stream type. In doing so, the channel abandons its original floodplain, resulting in a lowered water table. In seeking to establish a new "base level," gullies can migrate upstream and downstream as a consequence of flow hydraulics over headcuts.

Although rates of downcutting eventually subside, lateral erosion continues because flood energies are confined within the incised channel. As vertical banks are undercut and erode, the width-to-depth ratio continues to increase, creating a wide, shallow, and entrenched stream with no floodplain (an F stream type). The lateral erosion will continue until a floodplain is developed that is wide enough to dissipate flood energies. The development of a floodplain will only occur with good riparian vegetation that is resistant to flows and able to trap sediments and build banks. This will continue until the stream reaches a condition where it is naturally stable and in balance with the landscape setting. At this desired state (an E stream type), the stream is able to accommodate the flow and sediment produced by its watershed while maintaining its dimension, pattern and profile.

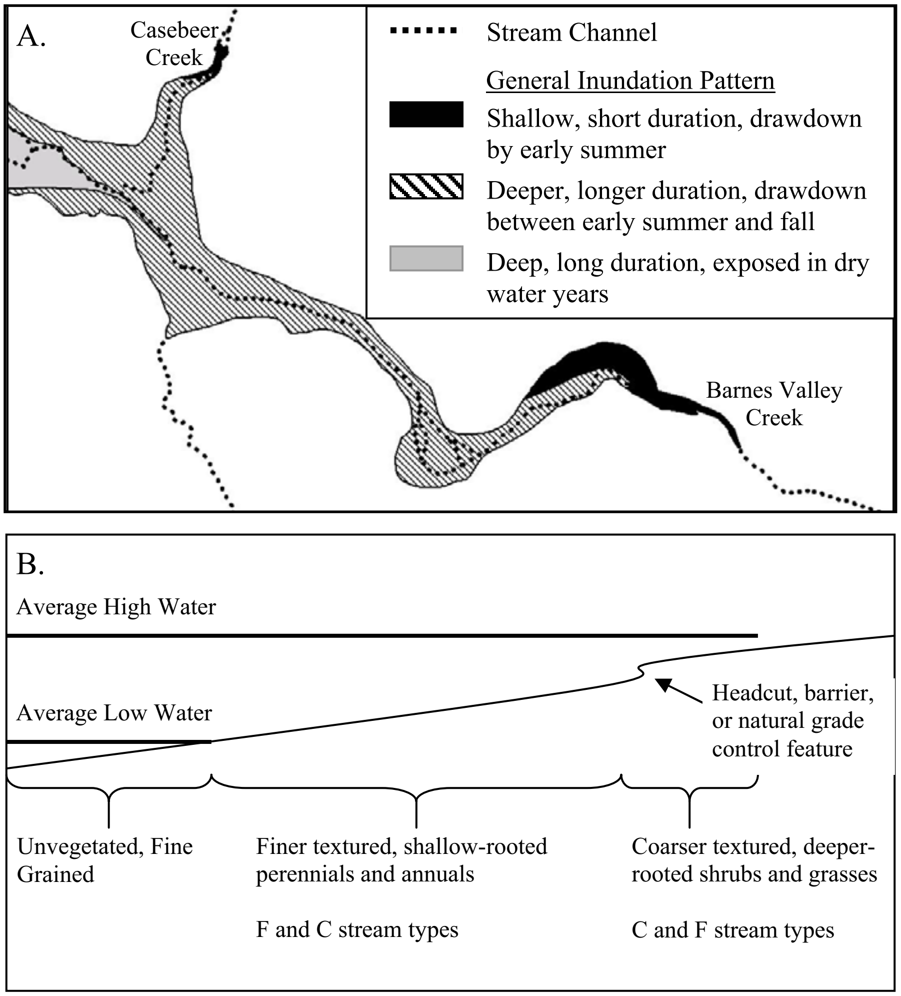
The magnitude of changes in channel shape due to land management varies, and not all streams are at the same stage in channel evolution. To a large degree, current land management practices are reversing past trends, and stream channels are beginning to stabilize. Recovery of channel form and processes will take many decades, however, as streams must create "meander widths" sufficient to accommodate peak flows and channel migration. This is accomplished by bank erosion, which is actively occurring. In upper watershed areas, downstream effects of channel incision are still being felt, and combine with watershed changes (roads and juniper encroachment) to increase fluvial erosion and gully development.

Effects of Dams and Reservoirs

The patterns of channel response upstream and downstream of large dams and reservoirs (Gerber and Willow Valley) within the analysis area reflect processes in addition to those described above. Channel responses are determined partly by valley width and gradient, substrate material, and the depth, seasonality, and duration of inundation (by reservoirs or augmented streamflows).

Streams tributary to reservoirs with water levels that vary over a wide range typically transform into C and F stream types over time. Riparian vegetation can become established in the areas of tributary streams that are subject to relatively shallow (and short duration) inundation (see Figure 5-2). Bed load sediment transported by streams is deposited preferentially in these areas when reservoir water levels are high. Due to the bank stability provided by riparian vegetation and point bar development associated with deposited material, C stream types can develop in these areas. Headcuts migrating upstream from degraded downstream reaches could eventually affect these areas.

Figure 5-2. Generalized plane views (A) and longitudinal profiles (B) of channel and riparian features associated with varying reservoir inundation.



In areas where water depths during the growing season exceed a few feet, perennial vegetation cannot persist and riparian areas become dominated by species that provide little bank stability. These areas are exposed to high flows during the late winter or early spring (when reservoir water surface levels are fairly low). Historically, it is probable that headcuts migrated upstream through these channels, lowering the channel grade and causing subsequent channel widening and development of F stream types. Because these areas have lower energy gradients (due to inundation) than upstream areas, fine sediments are a larger proportion of bed material, further degrading habitat quality.

The effects of Gerber Dam and Willow Valley Dam on streamflows, riparian vegetation, and bedload transport shape channel processes in Miller Creek and the East Branch of the Lost River. As discussed above, annual high flows in these streams typically occur in the summer months (except in years when spill occurs). These flows cover wide portions of the stream channel, preventing the establishment and growth of riparian vegetation. When peak flows (in excess of irrigation deliveries) are released (during periods when reservoir capacity is exceeded), bank erosion occurs due to the lack of riparian vegetation. In the upper portion of these streams, sediment moved downstream by bank erosion and other transport processes is not replenished at the same rate it is removed, since the dams trap bedload (and, to a lesser degree, clay and silt) from upstream sources. The downstream extent of these effects and the associated "bed armoring" (the dominance of coarse cobbles and boulders over finer gravels and sands) is not known. These effects likely occur even though the magnitude and duration of peak flows has been reduced. If larger peak flows were to occur, silt might be flushed from the system and the supply of sand and gravel replenished, at least temporarily.

2. Bed Material

Two general types of changes in the character of bed materials can be inferred: (1) the proportion of fine particles (silt, clay, and sand) has increased, and (2) the proportion of large materials (cobbles and boulders) has increased. The distribution of gravel is therefore diminished.

<u>Fine Particles</u> - The increased abundance of fine particles can be attributed to two main sources – bank erosion and delivery of eroded materials from uplands. Historic livestock use and other management impacts set the stage for increased rates of bank erosion as a consequence of bank disturbance and over-utilization or removal of riparian vegetation. As discussed above, these impacts set in motion a chain of events that led to channel incision and subsequent re-development of meander belts (which occurs through bank erosion and channel widening). This channel evolution process is still ongoing (and is in fairly early stages in some areas) and will be for quite some time. In addition, heavy livestock use along streams in some portions of the analysis area continues to contribute to the supply of fine sediment.

Upland sediments are supplied to streams via ephemeral hillslope channels, gullies, and roads. A number of processes are responsible for increased in sediment production from hillslopes. As discussed in the *Uplands and Hydrology* sections, reduced infiltration rates and other impacts have caused runoff generation to occur quicker and more frequently. Increased runoff caused increased rill erosion and gully development. This is especially true in areas in which the extent of bare ground has increased (due to juniper encroachment, heavy livestock utilization, high intensity fire, etc.) (Buckhouse and Mattison 1980; Buckhouse and Gaither 1982; NRCS 2001).

Road networks also supply fine sediment to streams. As discussed in the *Water Quality – Step 3* section, there are nearly 700 road drainage features that connect road segments to streams. These connections are pathways for sediment delivery. In addition, the road network affects sediment delivery indirectly, by concentrating flow paths and, in some cases, helping initiate gully development.

<u>Coarse Materials</u> - For moderate and high gradient streams (A, B, and C stream types), high proportion of cobbles and boulders are a reflection of landscape characteristics and stream energies capable of transporting smaller material. In lower gradient channels found in open valleys, however, the high proportion of these materials in some F stream types appears to be related to channel changes caused by watershed alterations. These streams have incised into alluvial valley-fill materials that had accumulated on top of basalt flows that are much coarser than the overlying sediments. The basalt layer prevented further incision and is now expressed over extensive portions of stream channels, especially in Pitch Log, Long Branch, and Barnes Valley Creek.

In Miller Creek, the large bed material size in the lower reach is due primarily to the steep walled canyon setting. The upper reach has a lower gradient, and therefore a higher proportion of finer material. There is anecdotal evidence that reductions in the supply of bedload due to Gerber Dam are reflected in the composition of stream substrates in the upper reaches of Miller Creek.

4. Large Woody Debris

The input rate and character of LWD is changed by land management activities. Logging near streams (within one site potential tree height) can reduce the long-term supply of LWD, especially if large proportions of large diameter trees are removed and stand densities are not managed to ensure the regeneration of large trees. Changes in forest composition (in terms of species and structure) due to fire suppression or other factors also affect LWD dynamics. Denser stands of small trees tend, in the long term, to deliver smaller LWD to stream channels.

Roads constructed near streams have a similar effect, though it may be longer lasting. Analysis of road inventory data yields a conservative estimate of about 60 miles of road within 120 feet (the height of one site potential tree) of stream channels. Many of these roads are located in rangeland vegetation types that would not supply LWD in any case. Of greatest concern are roads that traverse forested areas, such as in the northern portion of the analysis area and adjacent to Barnes Valley and Pitch Log Creeks. Roads that run through meadows near streams are also of concern, as LWD that falls across these roads is likely to be removed.

In the past, “stream cleanout” resulted in removal of LWD from streams in the PacifiC Northwest. Recognition of the functional importance of LWD led to the cessation of this practice, although streams are only gradually recovering from the detrimental effects.

Riparian Vegetation

Wetlands

Native wetlands that characterize the ecoregion drain a dry and wildfire prone upland and depend on the recharge from the adjacent forest and rangeland. Yet tree crowns, which rarely touched in historic woodland patterns now touch and effectively compete for the limited water resource (West and Young, 2000). So there is a growing risk to the pluvial lake basins and wetlands with the closed forest structure. Wetland risks are estimated by comparing changes in transpiration among forest and woodland structures.

In eastside semiarid forest, openings with well developed undergrowth sustain the desired high infiltration rates and spongy humus, which is a recurring goal in forest conservation (Rawley, 1994). And with a full complement of understory plants forestland and rangelands are absorbent wildlands, which recharge wetlands. And with attention to forest understory the water caught can be recharge that sustains the wetlands that characterize the Klamath/Goose Lake ecoregion. With attention to forest structure for snow catch, the forest can be economically managed for wood and water (Krutilla et al., 1983).

In rangeland forest there is a more developed history of researching species composition and functions, than in rainy forest. So there is enough information to build an awareness of the ill effects of tree density and their inhibition of litter humus processes (West and Young, 2000). Ecological weight should be given to forest encroachment, which was identified in and around Gerber (Riegel et al., 2002), Soil Survey Staff, 2002, b).

Status is more a function of understory plants (Mitsch and Gosselink, 2000, West and Young, 2000). And in Gerber’s riparian habitats, ecological status was correlated with species composition, surface litter, humus accumulation, soil infiltration rate, and rooting depth (Riegel et al., 2002). To sustain Gerber’s wetlands, the focus should be on forest and wetland ground conditions. Vigilance in needed to limit the adverse effect of forest encroachment and density on wetland. The playas depend on the recharge of thrifty forests.

Playas status or condition is not simplistic; it oscillates with wet and dry year runoff. The recharge and runoff process is evident in the vernal onespike oatgrass, *Danthonia unispicata*, communities associated with heavy clay soils. The communities act as seasonal wetlands on shallow clay soils that are recharged to saturation by snow melt water then drain as the growing season progresses. Down drainage, water ponds on the playas in Ephemeral Lakebeds ecological sites. Playas distributed across the Gerber drainage have ephemeral springtime sea of spike rush, *Eleocharis,* and rush, *Juncus balticus*. Riegel et al., (2002) identified the common spike rush as *Eleocharis palustris* in iconological types similar to the Ephemeral Lakebeds ecological sites (Soil Survey staff, 2002). These spike rush and rush plants are resilient rhizomatous plants, which fit the wetland ecology of dominating in early to late conditions (Mitsch and Gosselink, 1993). If spike rush and rush plants dominate with wet year runoff recovery the site condition is apt to be mid or higher status.

Water flow to the wetlands in wet and dry years varies with water competition, snow catch, and site infiltration, because surface water and ground water are a single resource. In "Streams and Ground Waters," Jones and Mulholland (2000) begin the synthesis among disciplines that study drainage basin to show the effects of biogeochemistry (soils) and bedrock environments (geology) that affect stream ecology (fisheries and water science). The nature and extent riparian zone is a key focus as is arid land process.
The connection between abundant wetland the adjacent rain shadow sagebrush and woodland vegetation conditions is emphasized by West and Young (2000).

Grasses are a key parts of the soil climate and wetland processes in Gerber. For example, Idaho fescue, *Festuca idahoensis* abundance is associated with effective snow catch, which enhances coldwater recharge. Yet Idaho fescue is in short supply in the overstocked forest of Goodlow and Yainax Mountains. And the current overstocked condition is inconsistent with the well-developed opening of historic frequent light surface fire regime in Ponderosa pine forest (Agee, 1993) and the frequent fire starts in and adjacent to Gerber (Fremont Forest Fire Staff, 2002).

The local opportunity or problem to balance forest overstory and grasses for water competition is part of a larger forest conservation issue. Altered forest habitats are one of the unintended consequences of fire control that yields regional losses of forest savanna and meadow habitats (Gruell, 2001).

Water Quality

Temperature

The primary environmental factors that influence stream temperature include local air temperature, direct solar radiation, stream depth, groundwater inflow, and riparian canopy (Adams and Sullivan, 1990). Although the relative importance of these factors is difficult to determine without constructing a watershed-specific heat budget, Brown (1969) identified net solar radiation as the main source of heat for streams. The important factors determining solar energy loading to a stream are the stream surface area exposed to solar radiation, the amount of riparian vegetation regulating solar inputs and the amount of discharge present in the streams (Brown 1969, 1983). Generally, wide shallow streams, when exposed to sunlight, tend to heat up more quickly than narrow streams with the same discharge. In other words, heat gained is directly proportional to stream surface area. Further, for the same solar energy input and surface area, the temperature change for a low discharge stream will be greater than that of a high discharge stream (Beschta et al., 1987).

Because direct solar radiation is the primary energy input to smaller streams, the condition of the riparian canopy and it's ability to regulate solar radiation is important for moderating the solar energy input to streams, especially during the summer months (Beschta et al., 1987). A structurally intact continuous riparian canopy is highly effective at reducing inputs of solar radiation to streams (Brown and Krygier, 1970) and regulating stream temperatures. Intensive grazing and fire suppression have altered the character of riparian vegetation within the Gerber watershed, decreasing the ability of the riparian vegetation to shade streams and regulate stream temperature. However, recent grazing management has created an upward trend in riparian vegetation within the watershed.

Channel conditions help determine the amount of solar radiation a stream receives, and can be a significant influence on stream temperature patterns. Increased width to depth ratios of channels as a result of channel widening is a major factor in determining the thermal regime of streams. Within the Gerber watershed, many stream channels have widened and lost their floodplains. Stream channels within the watershed have downcut in response to disturbances, losing connection with floodplains. Floodplains function to help dissipate streamflow energy as streams go over their banks. The loss of connection to the floodplain changes the amount of streamflow energy within the channel and can result in streambank erosion and subsequent channel widening during high flow events. These widened stream channels expose more surface area to solar radiation, increasing the temperature of the streams.

Stream discharge is another controlling component of stream temperature. Temperature change in a low discharge stream will be higher than in a high discharge stream with the same surface area exposed to solar radiation. Water infiltrated into soils is an important component of stream recharge, particularly in the warm summer months. This recharge is often cooler temperature water than the stream flow, and also increases the discharge in the stream. Changes in vegetation, such as juniper encroachment and overstocked forest stands, have decreased the infiltration rate of the soils within the Gerber watershed. Thereby decreasing the amount of temperature-moderating recharge to streams in the warm summer months.

The relationships between streamflow and water temperature are illustrated by data from Miller Creek (Figure 5-3). During periods of low streamflow (before and after the irrigation season) water temperatures are sensitive to hourly and daily fluctuations in air temperature. This is reflected in spikes in the seven-day averages and a wide range between daily maximum and minimum values. When streamflows are high, variability due to weather is quite low. Besides illustrating this key relationship, temperature patterns in Miller Creek indicate the potential impacts of reduced flows during periods when air temperatures may be high and resident fish are sensitive to high water temperature (discussed further in the *Aquatic Habitat* section).

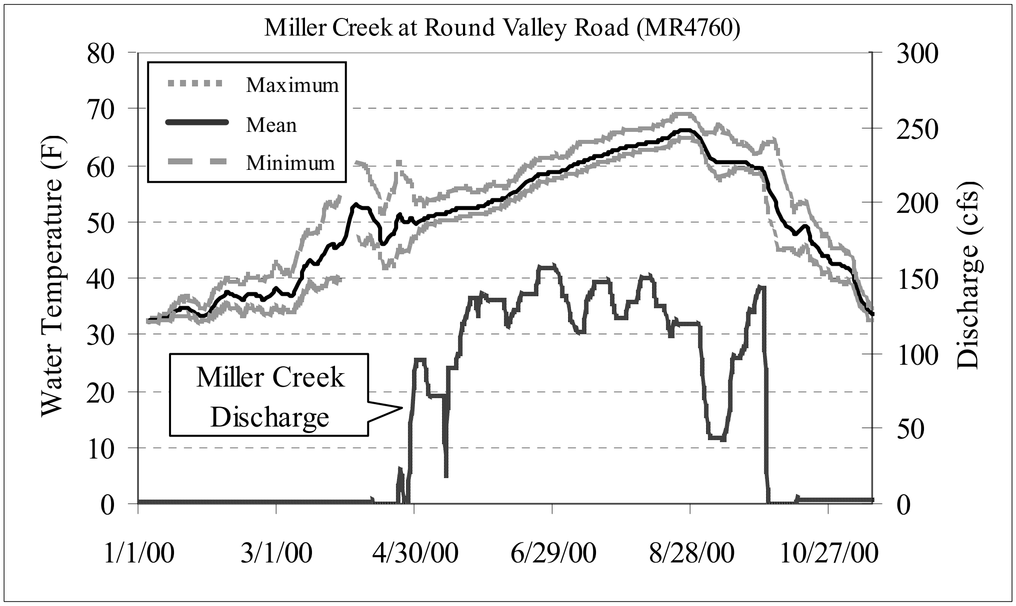
Sedimentation

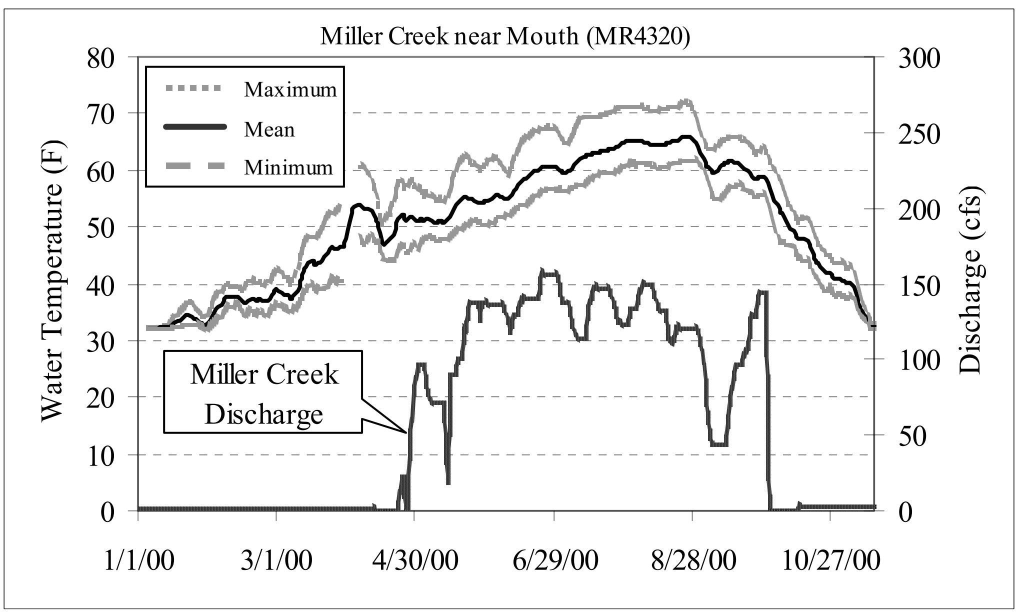
Current conditions of sedimentation to streams are much higher than in reference conditions. Roads are often a chronic source of sediment within a watershed. A number of subwatersheds within the Gerber watershed have high road densities and are likely contributors of sediment to the stream channels. Changes in vegetative condition have also resulted in higher sedimentation to stream channels. Decreased infiltration rates as the result of juniper encroachment and overstocked forest stands result in greater overland flow and more exposed bare ground. The combination of bare ground and increased overland flow allow more sediment to become entrained and transported to streams.

Nutrients

As discussed in *Current Conditions, Step 3 - Water Quality* section, sediment movement can transport nutrients such as phosphorus and inorganic nitrogen. Additionally, nitrogen can dissolve in surface and groundwater and be transported with the flowing water. Land management activities have likely increased the amount of nutrient loading to the surface water system. Increased runoff and bare ground within the watershed lead to increased sediment transport, thereby increasing nutrient loading of sorbed nutrients (nutrients chemically bonded to sediment particles) to surface water systems.

Figure 5-3. Seven-day running averages of maximum, mean, and minimum water temperatures, plotted with average daily discharge from Gerber Dam.
Data from BLM files and USBR Klamath Basin Area Office.





Stream energy dissipates upon encountering a reservoir of standing water. Once the energy has dissipated, suspended sediment settles out of the water column. In this manner, the reservoirs act to trap some of the nutrients in the reservoirs and isolate them from the rest of the stream system. However, nitrogen is weakly bonded to soil particles and may remain in the water column. The nutrients in the reservoirs may still be available for plant uptake, therefore the prolific growth of aquatic weeds in many reservoirs is likely the result of high nutrient loadings.

Reservoir Water Quality
The abundance of phosphorous and nitrogen in reservoirs leads to seasonally high rates of aquatic plant and algae growth and decay. These eutrophic conditions impact pH and dissolved oxygen (DO) levels. Chemical reactions that occur during photosynthesis in nitrogen-fixing plants can enhance pH levels, especially near the water surface. Decay of plant material results in the consumption of dissolved oxygen, especially where material settles near the bottom of reservoirs. This consumption can be offset somewhat by plant respiration, but only during the daylight hours.

Habitat for Aquatic Species

Overview
In general, aquatic species habitat in the Gerber/Willow Valley watershed are subject to highly variable water levels seasonally and an over larger time scales (5-10 year drought cycles). Native species employ flexible life history strategies that allow them to take advantage of a existing habitat types to carry out spawning, nursery and rearing, and over-wintering.

In this section historic conditions in Step 4 are used as basis for describing how current conditions have shaped current distribution and abundance. The same parameters are discussed as they relate to population viability for the selected species (redband trout, Klamath Basin suckers).

Selected Parameters:
- Fish passage and distribution
- Stream temperature
- Spawning habitat
- Habitat complexity (amount of large woody debris and # pools/mi)
- Exotic species

Species Distribution and Abundance
A reasonable explanation for the current distribution of shortnose suckers, Klamath largescale suckers, and tui chub is that the marshes at the bottom of Barnes Creek and in Barnes Valley proper supported these species, albeit in relatively low numbers, prior to the dam. Even if these marshes did not support resident populations because they periodically dried up, it is reasonable to assume that some migrating adult and juvenile suckers or stream resident suckers could have been trapped behind the dam upon its construction and developed into adfluvial sub-populations within Gerber reservoir. This theory is supported by the fact that stream resident suckers are routinely observed by BLM in Long Branch Creek. Additionally, stream resident trout have been observed in the spring-fed tributaries. The alternative explanation is that neither suckers nor trout were present in the watershed and both were at some point transplanted into Gerber Reservoir; however, given their life history and habitat requirements, and accounts of early homesteaders (Sobel et al, 1992) it seems unlikely that suckers and trout were not present in the watershed during the construction of Gerber dam. Additionally, both migratory trout and suckers were apparently abundant the Lost River near Bonanza in the late 1800s (Ray 1963, Helfrich 1972). The ability of redband trout and potentially some sucker species to switch from resident to fluvial or adfluvial strategies is inherent and not easily lost to selection, even after many generations (Messmer, personal communication, 2000).

Because of Gerber Reservoir, lake dependent species such as shortnose suckers and exotic fish have probably increased in abundance over the reference condition. Gerber reservoir has allowed for the expression of adfluvial life history strategies in trout and suckers locally in Gerber tributaries. Because of the amount of habitat afforded by lake environments and favorable conditions for growth, fish attain larger size and have higher fecundity. Constructed reservoirs throughout the analysis area have allowed for the establishment of warm water species such as yellow perch, crappie, and largemouth bass. None of these species would have flourished in the reference condition because of the lack of deep lacustrine habitat. The lower portions of East Branch of the Lost River and Miller Creek were likely used as migration and spawning habitat for fish living in the Wetlands in the South end of Langell Valley.

Fish Passage

Channel degradation (particularly lateral incision leading to increase width/depth ratios), and reduced low base flows are the primary factors contributing to fish passage limitations in the Gerber /Willow Valley watershed. These same factors also contribute to water quality barriers that affect fish passage and survival (discussed below). Some road-crossing barriers were identified on BLM and Forest Service lands. We lack understanding of the role that downstream fish passage at Gerber Reservoir, and upstream passage from Miller Creek affects sucker and trout populations in Miller Creek. Some combination of these migration factors is the mechanism that re-seeds Miller Creek when it periodically dries up due to reservoir management during drought periods. Other diversions and reservoirs that exist on fish bearing streams on public and private lands warrant further study.

Stream Temperature

High stream temperatures associated with low flow, rocky substrate (increases convective heat input) in the watershed probably severely limits distribution of trout in the Gerber Willow Valley watershed. The effects of temperature on dissolved oxygen could indirectly cause problems for other species (see Gerber Reservoir water quality discussion). Redband trout are at risk in the perennial spring fed tributaries because of flow diversions and channel degradation leading to excessive warming. Miller Creek trout are at risk of periodic extirpation of because drought and low flow conditions. Channel condition, in this case, excessive stream width, can cause extremes in stream warming when low flow occurs during hot weather. An alternative analysis that was not conducted would be to apply the higher tolerance values for redband trout suggested by Rodnick et al (2002). High temperatures during the spawning window for trout may be a significant limiting factor for successful spawning and incubation. Low reproductive success for trout during average and below average water years is apparent from Gerber Reservoir fish investigations (USBR 2003 review draft).

Large Woody Debris

Large woody debris for the 75th percentile of natural and near natural streams in the northern Great Basin (Quigley et al, 1997) is suggested as a benchmark for historic conditions. Since this data was collected in primarily forested streams it may suggest higher values than were historically attained in the Gerber/ Willow Valley area, which has a high percentage of streams in rangeland areas.

Table 5-5. Frequency of LWD 20 inches in diameter for Northern Great Basin Streams (Quigley et al, 1997) compared to existing conditions in Barnes Valley Creek and Miller Creek.

					Large Wood (> 20" diam)			
Stream Name	Reach #	Reach Length (miles)	Slope Class (%)	Stream Width (Ft)	Recom Value	Applied Value	Actual Pieces/mi	Large Boulders (>1.4 ft diam)
Barnes Valley*	1	0.4	<2%	49.2	0.025	2.7	0.0	209
Barnes Valley	2	2.4	<2%	32.8	0.025	4.0	6.4	1304
Barnes Valley	3	2.7	<2%	19.7	0.025	6.7	1.6	80
Barnes Valley	4	0.5	<2%	26.2	0.025	5.0	0.0	0
Miller Creek	1	1.2	<2%	52.5	0.025	2.5	12.9	1625
Miller Creek	2	3.4	2-4%	52.5	0.085	8.5	9.7	2784
Miller Creek	3	2.7	<2%	62.3	0.025	2.1	14.5	2028

*reaches were within in the full pool area of reservoirs and therefore condition was influenced by the reservoir

For this assessment, LWD is defined as being 20 inches in diameter on the small end and greater than 35 feet long in ponderosa pine and mixed conifer sites. The natural or near natural frequency is determined using the table below, and the formula for desired numbers per mile = table value x 5280/average riffle width in feet. For example, a stream with a 10-foot average riffle width and a slope of 2-4% would be expected to have 11 pieces of LWD/mile at the 50th percentile and 45 pieces at the 75th.

An important consideration when interpreting these results is that comparison values were calculated are a function of stream width. If watershed impacts have resulted in wider stream channels relative to the reference or historical condition, we will underestimate the frequency of large wood for the reference condition. Since actual stream widths were used, we may have underestimated the reference condition for number of pieces of wood in Gerber stream. An alternative analysis would have been to calculate a reference stream width value for a reference channel based on regional curve data for width as a function of drainage area. These values would yield a higher large wood frequency if stream reference width values were less than existing conditions.

In Barnes Valley Creek, only one reach (Reach #2) had a higher frequency than the suggested reference condition. Boulders, which can function like large wood to provide channel resistance, cover, and scour features, were also lacking in all reaches except Reach #2. Overall, Barnes Valley Creek lacks complex habitat feature that provide high quality fish habitat.

In Miller Creek, existing stream width is much higher than the current flow regime (controlled reservoir releases) would suggest under natural conditions since peak flows are captured behind the dam. Therefore, the results are difficult to interpret. It appears that the amount of large wood is consistent with desired values based on current stream width. Large boulders are abundant throughout the canyon and are the dominant features controlling channel resistance, providing cover and scour features.

Pools

The number of pools per mile for the 75th percentile of natural and near natural streams in the northern Great Basin (Quigley et al, 1997) is suggested as a benchmark for historic conditions. The natural or near natural frequency is determined using the table below, and the formula for desired numbers per mile = table value x 5280/average riffle width in feet. For example, a stream 10 feet wide with a slope of <2% would be expected to have 14 pools/mile at the 50th percentile and 28 pools/mile of at the 75th percentile. Pool width/depth ratios are another measure of habitat quality that is applicable in a dimensionless ratio.

<u>Pool Frequency</u>
As was the case for large wood, an important consideration when interpreting these results is that comparison values were calculated as a function of stream width. If watershed impacts have resulted in wider stream channels relative to the reference or historical condition, we will underestimate the pool frequency that the reference condition would have. Since actual stream widths were used, the reference condition for pool frequency may have been underestimated.

Results of the pool frequency analysis are mixed with some units having more than the reference values and some less. In Barnes Valley Creek, only one reach (Reach #2) had a higher frequency than the suggested reference condition. Boulders, which can function like large wood to provide channel resistance, cover, and scour features, were also lacking in all reaches except Reach #2.

<u>Pool width to maximum depth ratio</u>
From a fish habitat perspective, this is another measure of the relative habitat complexity and amount of cover provided by water depth. It can also be an indicator of sediment supply problems (too much or too little), channel degradation, or flow regime changes. Both Barnes Valley Creek and Miller Creek have high

ratios—that is they are below values suggested by Quigley et al (1997) and Gerber reference condition. It should be noted that the reference condition (w/d ratio 7.05) is relatively high compared to recommended values of 4.2-5.6 (Quigley et al, 1997). Either Antelope Creek is below potential or streams in this are perhaps not able to achieve low ratios due to geology or some other constraint. Miller Creek existing condition values are two to three times higher than the reference condition. This is likely a result diminished peak flows and the lack of ability to build and maintain channel banks because peak flows do not recede during the growing season. Additionally, Miller Creek lacks material (sediment supply) to build banks even the hydrologic regime was adequate.

In general, streams in the analysis area are significantly below reference values for width/ depth ratios. Either pools have filled in with excessive sediment or the stream is widened over potential. The latter is the best explanation since there are few indicators of channel morphological changes due to excessive sediment load (e.g. channel braiding).

Table 5-6. Number of Pools per mile (as a function of stream width) and Pool width /maximum depth ration for streams surveyed in 2001.

		Reach	Slope	Stream						
	Reach	Length	Class	Width	Pools/mile			Pool W/D Ratio		
Stream Name	#	(miles)	(%)	(feet)	Desired	Existing	Refer	Desired	Existing	Refer
Barnes Valley*	1	0.4	<2%	49.2	5.7	11.1	8.0	5.6 - 4.2	7.9	7.1
Barnes Valley	2	2.4	<2%	32.8	8.5	62.5	12.0	5.6 - 4.2	9.2	7.1
Barnes Valley	3	2.7	<2%	19.7	14.2	5.8	20.0	5.6 - 4.2	5.8	7.1
Barnes Valley	4	0.5	<2%	26.2	10.7	15.5	15.0	5.6 - 4.2	7.7	7.1
Miller Creek	1	1.2	<2%	52.5	5.3	12.1	7.5	5.6 - 4.2	13.9	7.1
Miller Creek	2	3.4	2-4%	52.5	4.4	10.1	x	6.2 - 4.6	12.7	x
Miller Creek	3	2.7	<2%	62.3	4.5	10.1	6.3	5.6 - 4.2	22.0	7.1
Antelope*	1	0.2	<2%	4.3	65.4	34.6	92.1	5.6 - 4.2	8.1	7.1
Antelope	2	0.2	<2%	6.0	46.4	40.4	65.3	5.6 - 4.2	7.9	7.1
Antelope**	3	1.0	<2%	5.6	50.0	47.1	70.4	5.6 - 4.2	7.0	7.1
Antelope**	4	1.0	<2%	7.9	35.5	68.3	50.0	5.6 - 4.2	7.1	7.1
Antelope	5	0.3	<2%	14.8	19.0	30.8	26.7	5.6 - 4.2	9.9	7.1

*reaches were within in the full pool area of reservoirs and therefore their condition was influenced by the reservoir
**reaches were used for the "Gerber\Willow Valley reference condition"
Values are compared to recent literature (Quigley et al, 1997) and to the Gerber "Reference condition" (Antelope Creek).

Spawning Habitat

The reference condition level of fines for each particular geologic type has not been identified. Since geology is similar throughout the analysis area, it is reasonable to compare the Antelope Creek values to other streams in the watershed. Less than 30% fines is generally attainable in the top four inches of spawning substrate throughout the Fremont National Forest (Upper Sycan Watershed Analysis). In Antelope Creek, values were between 18.5 and 26.3 in the reference reach. Based on this information and current research (Quigley et al, 1997) recommendations (<25% fines), we can compare assumed historic condition and existing condition.

The limitations of the substrate composition methodologies were described in Section 3 and suggest that percent fine sediment was probably underestimated. Bulk sieve analysis of the surface and subsurface layers in a riffle is a more accurate and appropriate methodology. Using our own reference reach data from Antelope Creek (14.7% fines), only one reach (Antelope Reach 1, 35.5%) has values that are higher than the reference condition.

Table 5-7. Percent fine substrate (<2mm diameter) and percent gravel (2mm - 64mm) in riffles for survey reaches.

Stream Name	Reach #	Reach Length (miles)	Slope Class (%)	Stream Width (feet)	Fines in Riffles (%)	Gravel in Riffles (%)	Reference Reach % Fines	Reference Reach % Gravel
Barnes Valley*	1	0.4	<2%	49.2	5.0	20.0	14.7	22.4
Barnes Valley	2	2.4	<2%	32.8	7.0	25.0	14.7	22.4
Barnes Valley	3	2.7	<2%	19.7	x	x	14.7	22.4
Barnes Valley	4	0.5	<2%	26.2	x	x	14.7	22.4
Miller Creek	1	1.2	<2%	52.5	1.0	12.0	14.7	22.4
Miller Creek	2	3.4	2-4%	52.5	5.0	35.0	14.7	22.4
Miller Creek	3	2.7	<2%	62.3	7.0	19.0	14.7	22.4
Antelope*	1	0.2	<2%	4.3	35.5	32.6	14.7	22.4
Antelope	2	0.2	<2%	6.0	14.4	37.7	14.7	22.4
Antelope**	3	1.0	<2%	5.6	14.9	26.3	14.7	22.4
Antelope**	4	1.0	<2%	7.9	9.2	18.5	14.7	22.4
Antelope	5	0.3	<2%	14.8	10.5	31.9	14.7	22.4

*reaches were within in the full pool area of reservoirs and therefore condition was influenced by the reservoir
**reaches were used for the “Gerber\Willow Valley reference condition”

Suitable substrate for spawning depends not only on composition but also on distribution and the amount of embededdness - that is, how much of the fines are packed around the gravel preventing fish from building viable redds. Shortnose and Klamath Largescale suckers, although they do not build nests, also need substrate which is not embedded and has adequate water exchange. Embededdness has not been measured in the watershed but has been documented by stream surveyors in many locations. Additionally, substrate data was not collected by ODFW surveyors in some reaches because there were no apparent riffles (ODFW 1997). A general lack of typical spawning areas (gravel bed riffles and pool tail-outs) is apparent in the watershed. This is perhaps, in part, a function of the dominant basalt parent material, which erodes as small sand and silt particles from large cobble and boulder. This bimodal distribution of particle sizes is apparent in many streams in the watershed (see pebble count data). This can also be and indicator of high bank erosion rates because banks are composed of mostly fine material.

In Miller Creek, spawning gravel does not necessarily occur in places with adequate flow and depth for spawning. Rather, it is distributed in the low velocity channel margins and small pockets behind boulders. This aerial distribution may significantly reduce the spawning habitat quality and may be a function of stream width.

Exotic Fish

The presence and abundance of exotic fish and bullfrogs in the watershed appears to be a function of pond and lake habitat that did not exist prior to euro-American settlement. There are no indications in fish population trends that indicate non-native fish are displacing native fish as a result of predation of competition. Furthermore, the ability to dry out, intentionally or not, of many of the ponds and reservoirs allows managers to control species composition and abundance if necessary. Management of stream habitats that mimic historic conditions should prevent non-native species from acquiring a competitive advantage over native species.

Population viability

Population viability addresses the continued existence of well-distributed populations or subpopulations over specific time periods (Marcot and Murphy 1996). To evaluate population viability for suckers and trout in the Gerber/Willow Valley Watershed, the relative effects of various watershed functions and process are integrated and assessed as they relate to the biological requirements of the species in question. Furthermore, health and viability of native aquatic species can be used as an indicator for watershed health, being linked to upland, riparian, and channel conditions. If watershed conditions are conducive to long-term native fish population viability, then the desired watershed attributes should occur across the landscape. Those attributes include good water quality, food production, good fish and wildlife habitat, and connectivity within and between drainages. Recognizing the connection between uplands, riparian areas, stream channels, and habitat for aquatic species, the following integrated assessment is presented to address population viability for suckers and trout.

Not enough information is available to conduct thorough population viability analysis. In general, the Gerber/Willow Valley watersheds fish populations are interrupted by severe habitat barriers (low flow and water quality) and man-made physical barriers such as Gerber Dam. Population viability is dependent on the ability of subpopulations to have genetic exchange with neighboring populations. Additionally, subpopulations within a watershed need to be of a sufficient number of and of a sufficient size such that, under periods stress or disturbance, some individuals or subpopulations survive to colonize new areas or re-colonize after habitat conditions improve. These populations must have enough genetic diversity such that some individuals are able survive during periods of changing environmental conditions. Because Gerber Dam is a 100% barrier to upstream migration, the populations of suckers and redband trout upstream of the dam do not fit the definition a fully functional meta-population. Therefore, they may not be viable and self-sustaining in the in the long term.

In Miller Creek, there is the potential for fish to re-colonize from Gerber Reservoir or from the Lost River. If the assumption that this can occur readily is valid, population viability is more dependent upon favorable conditions occurring of sufficient duration and frequency that it is advantageous and adaptive for the population fish to colonize and exploit the area for growth and production.

Limiting factors related to migration included barriers, associated with low flow, coupled with high stream width and potential freezing in winter (also associated with low flow). Minimum flows during the spawning and migration period and a lesser minimum flow to prevent freezing, would allow this population to persist assuming there was a viable adjacent fish population (Gerber or Lost River) to re-colonization after dry periods resulting from extended drought. However, the assumption that Gerber or Lost River can be viewed as a reliable source population may not be valid. An alternative perspective could be that Miller Creek, because it has an apparent capacity to be productive for rearing and recruitment, is a necessary subpopulation in the Lost River meta-population structure. In that context, population viability in the Lost River could be dependent on relatively stable populations in Miller Creek.

Willow Valley reservoir has not been colonized with suckers or redband trout likely because there are few years with sufficient water during the spawning season to allow migration; and the dam is likely a barrier for upstream fish migration. Fish populations are lost in Willow Valley Reservoir periodically during extended drought periods (e.g. 1992). However, the watershed may be able to support these populations if significant barriers were removed or retrofitted and minimum flow levels established.

Integrated Assessment

Not enough population specific information is available to conduct thorough population viability analysis. Therefore this assessment is qualitative and relies on professional judgment. In general, the Gerber/Willow Valley watersheds fish populations are interrupted by severe habitat barriers (low flow and water quality) and man-made physical barriers such as Gerber Dam. In many fish populations, long-term viability is dependent on the ability of subpopulations to have genetic exchange with neighboring populations. Additionally, subpopulations within a watershed need to be of a sufficient number of and of a sufficient size such that, under periods stress or disturbance, some individuals or subpopulations survive to colonize new areas or re-colonize after habitat conditions improve. Meffe (1996) states that genetic variability of a population determines its fitness or ability to respond and adapt to environmental changes, and low genetic variability may result in decreased adaptability. Populations of a few 100 individuals or less are apt to have low genetic variability. Low populations of redband trout are apparent in Gerber Reservoir and its tributaries. Because Gerber Dam is a 100% barrier to upstream migration, no genetic exchange is provided from downstream populations and re-colonization following extinctions cannot occur without human re-introduction.

Fire exclusion

A portion of the watershed's forest stands have dense fuel levels resulting from nearly 100 years of fire exclusion. Prior to the early 1900's, the natural fire return interval maintained relatively open forest stands with less understory fuels to carry a fire from the ground to the canopy layers. Dense and early-to-mid-seral stands are at high risk of catastrophic fire which could result in added sediment and altered flow regimes in watershed streams.

The cumulative and confounding effects of fire exclusion, grazing, and channel incision have permitted conifers and juniper to expand into meadows and other riparian areas, promoting competition with riparian plants (sedge, rush, willows, aspen, and cottonwood,) necessary to maintain bank stability and proper stream types. In addition, junipers are expanding into the drier, deeper-soil pine sites in the riparian stringer portions of the watershed. This continued expansion could lead to more areas in juniper woodlands, replacing other native vegetation types, leaving the soils prone to erosion, and probably reducing late summer stream flows.

Roads and soils

High road densities relative to stream density (Table 3.3) is another reason why the watershed is functioning below potential in some subwatersheds for native fish viability. Many of the roads within the watershed parallel and/or cross stream channels, increasing the drainage network. Additionally, the effects of timber harvest activities and grazing on soil resources have increased compaction and altered flow patterns. The road network and detrimental soil compaction have likely modified the timing, magnitude, and frequency of peak flows. Higher peak flows can prevent natural healing of unstable banks, as well as influence the amount of sediment reaching stream channels. Sedimentation can lead to silting in of spawning gravel, low food production, and pool filling.

Channel condition

The relative proportion of Rosgen F and G stream types (39%, table 3-6) suggest that a significant proportion of the watershed may be in a state of disequilibrium. These channel types usually provide poor quality habitat and can be associated with high bank erosion rates. At some locations identified in the rangeland assessments, continued livestock grazing may be negatively influencing the ability of the stream channel to re-vegetate and form stable banks. Elsewhere, artificially constricted streams at road crossings and impoundments are preventing floodplain and riparian vegetation recovery.

When compared to reference conditions, the stream survey data suggests that habitat complexity (pool quality, LWD), is lacking in many of the stream reaches within the watershed. This may partly be a function of the small size of many of the streams, and the flashiness that is characteristic of the landforms within the watershed.

Stream Temperature

An additional reason for concern regarding redband trout viability is high stream temperatures throughout the watershed, including high temperatures during the spawning and incubation periods. These temperatures can be stressful or lethal to native fish, negatively affecting growth and development in all life stages. In addition, large willows or overhanging grassy/sedge vegetation that could provide shade are lacking along many of the meadow reaches. Also, many reaches have width-to-depth ratios that are significantly higher than potential, which increases the water surface area exposed to solar radiation.

Migration barriers
Migration barriers including low flow, high stream temperature, dams, culverts, diversions, and habitat quality barriers (excessive width) exist throughout the watershed, disrupting connectivity and inhibiting free movement of fish within and amongst drainages. Movement is necessary for spawning, access to cool water refugia, and emigration from degraded habitat into good habitat.

In Miller Creek, there is the potential for fish to re-colonize from Gerber Reservoir or from the Lost River. If the assumption that this can occur readily is valid, population viability is more dependent upon favorable conditions occurring of sufficient duration and frequency that it is advantageous and adaptive for the population fish to colonize and exploit the area for growth and production.

Limiting factors related to migration included barriers associated low flow coupled with high stream width and potential freezing in winter (also associated with low flow). Minimum flows during the spawning and migration period and a lesser minimum flow to prevent freezing, would allow this population to persist assuming there was a viable adjacent fish population (Gerber or Lost River) to re-colonization after dry periods resulting from extended drought. However, the assumption that Gerber or Lost River can be viewed a reliable source population may not be valid. An alternative perspective could be that Miller Creek, because it has an apparent capacity to be productive for rearing and recruitment, is a necessary subpopulation in the larger Lost River which is part of the Klamath Basin metapopulation structure. Noss et al. (1997) defines a metapopulation as a group of subpopulations, spatially distinct but connected by at least occasional dispersal. Because Miller Creek redband are part of the larger Klamath Basin populations, they are considered a part of this metapopulation. Applying the metapopulation concept to the Gerber Watershed, each subwatershed may host a separate subpopulation.

Willow Valley reservoir has not been colonized with suckers or redband trout likely because there are few years with sufficient water during the spawning season to allow migration; and the dam is likely a barrier for upstream fish migration. Fish populations are lost in Willow Valley Reservoir periodically during extended drought periods (e.g. 1992). However, the watershed may be able to support these populations if significant barriers were removed or retrofitted and minimum flow levels established.

Conclusion
Currently, the less than desired conditions of these elements inhibit the watershed from functioning appropriately to assure survival and persistence of native redband trout. Klamath basin suckers have less stringent requirements for substrate, stream temperature, and habitat complexity. Furthermore, the majority of the sucker populations spend relatively little time in the stream environment and are there only during high flow conditions. The population age structure and spawning distribution surveys are indicative of semi-regular recruitment and genetic variation within the populations is high. High genetic variability will help ensure the viability of populations (Meffe 1996). Thus, population viability for Gerber sucker populations is heavily dependent on conditions conducive to survival in the reservoir environment rather that the stream environment. Improvements in water quality in Gerber Reservoir should be realized as a result of positive trends in riparian and upland conditions. These improvements will increase the likelihood of survival and persistence during extended drought provided that adequate lake levels are maintained that prevent overcrowding.

II. Vegetation

Forested Uplands

The two main contributors to the difference between current and reference conditions of the forested communities are timber harvest methods, and the alteration of the natural fire regime. Effects of insects and diseases are closely connected to these two overwhelming forces.

1. Past Management Practices

Fire protection and widespread harvest of large ponderosa pine has led to a change in landscape patterns, species composition, stand structure, and resistance to insects and diseases. What were extensive, open and park like stands of ponderosa pine have turned into dense, multistory structures with weakened overstories and high fuel levels. Conifer seedlings and shrubs have replaced grass species in many under stories. Mixed conifer stands have closed into more homogenous structures with a species composition shift to white fir. Fine fragmentation has shifted to coarse and blocky due to the even-aged management, (mainly over story removals and clear-cutting on private industrial lands), and large, stand replacing wildfires.

With fire protection and heavy grazing practices, dense understories began to develop under ponderosa pine canopies. These understories were pine and juniper at the lower/drier end and white fir at the upper/wetter end. Conifers have steadily encroached into meadows and riparian areas. Following WWII, harvest intensity ran the spectrum from removal of single “high risk” trees to clearcutting of entire stands. The fine scale fragmentation inherent within these stands was being replaced with a coarser “blocky” pattern. Early seral components within the larger historic stands were becoming their own stands. Species composition shifted from pure ponderosa pine to mixed conifer heavy to shade tolerant white fir. Repeated salvage operations resulted in many stands being entered several times. Unacceptable levels of soil compaction are being observed across many areas. Basalt derived soils, common in this area, are at highest risk. Recent clear-cutting has further added to the coarser, “blocky” landscape pattern.

2. Insects and disease

Recent symptoms of poor forest health are being blamed on the combination of multiple logging entries, unnaturally high densities and the shift to shade tolerant species. Increases in the virulence of annosus and armillaria root diseases are linked to soil compaction and denser stands. Dwarf mistletoes have expanded, in part, due to the creation of multi-storied stands of a single species (resulting from partial overstory removals).

Frequent natural fires functioned as a control to dwarf mistletoe infections. Fire prevention has allowed mistletoes to easily spread in multistory stands. The degree of change is linked to the number of fire cycles missed. Expansion is most notable in ponderosa pine and high energy mixed conifer communities. Bark beetle mortality is directly related to the size class and high densities that are occurring in these post-fire dependent stands. Extensive outbreaks of fir graver in the 1990’s were made possible by the increase of white fir on dry pine sites, and their stressed condition from drought.

3. Fire Ecology

The alteration of the natural fire regime has affected ponderosa pine types at the regional scale. fire management strategy during most of the 20th century included prevention, detection, and suppression, and altered a reference condition fire regime which had promoted the development of open parklike stands. The speed at which stands have shifted from single to multistory structures seems remarkable until one realizes that on average, based on historical fire return interval, up to 10 fire cycles have been missed in ponderosa pine communities. With the change in stand structure and density comes a change in how these ecosystems are reacting to natural disturbance events. Due to the absence of "maintenance fires", wildfires today are more likely to produce "stand replacement" events. Newly developed shrub/seedling understories increase fuel loadings and create ladders into canopy crowns. Under such conditions, large, stand replacing fires are far more common than they ever were historically. Soil damage from such an event is severe and at a landscape scale. Soils may take only two to three years to recover from a light fire, but an intense, hot fire that burns through the deep duff and "cooks" the soil may take centuries to recover (Pyne 1996).

Fire prevention efforts, livestock grazing, and timber harvest has driven the most drastic changes within ponderosa pine stands. Understories of "second growth" ponderosa have developed in the absence of frequent natural burns. These multistory stands are taxing the growing space provided on most sites.

Higher elevation mixed conifer has not been as radically altered by fire suppression, as have the ponderosa pine and lower elevation mixed conifer. What was historically a somewhat patchy, coarse fragmentation is today very homogenous. Stands are becoming less structurally diverse, broken only by plantations and overstory removal units. In fact, not accounting for structural stage distribution, some clear-cut harvested areas resemble what a fragmentation pattern may have looked like in mixed conifer types. Mid seral structure is slowly disappearing. The future mid seral stands are still sapling-sized plantations and define the lag time in seral distribution.

Old Growth, LOS and Historic Range of Variability
As reported in Step 4, page (4-10), the best information available on the historic vegetative types in the Gerber/Willow Valley Watershed comes from the 1946 and 1947 Timber Type Maps. The current structural classes have not been mapped, which represents a data gap in the analysis. The harvest layer is also not complete. This results in a lack of data to compare historic late/old seral stages in a historical and current context with a high level of confidence. However, based on the level of agreement between 1946-47 timber types and current GIS ecoclass acreages, an adequate comparison of historic and current conditions in some areas can be made.

From the data and inspection of current stand conditions, it can be concluded that the ponderosa pine forested types are below the historic range of variability for LOS single storied stand structure. This conclusion is based on the age classes of the understory vegetation that are not presently old enough to have been a significant component of the pre-1900 stands. Hopkins describes historical old growth ponderosa pine stands (pre-1900) as having approximately 20 – 30 trees per acre in the 17 inch and larger diameter classes with fewer than 5 seedlings per acre and less than one downed log per acre. Numerous spike topped trees occurred in these stands.

Open Forest Communities
The open pine associations such as ponderosa pine-juniper/mountain mahogany-bitterbrush-big sagebrush/fescue, ponderosa pine-quaking aspen/bluegrass and ponderosa pine/mountain big sagebrush/bluegrass have been affected by the interrupted fire regimes that once kept their understory vegetation in a park-like condition. Ponderosa pine communities with a big sagebrush understory were maintained in an early to mid seral condition that favored herbaceous species and a highly dispersed pine overstory. This herbaceous/forb understory ecosystem has been largely replaced with mature brush species and conifers in varying degrees of regeneration. Turn of the century grazing also attributed to this increase in seedling survival by reducing herbaceous plants ability to compete and provided favorable seedbed conditions through trampling and litter displacement. Understory forested vegetation in the ponderosa pine type exceeds historic density.

The absence of fire has allowed juniper densities to increase in both open forested communities and in shrub communities. This has lead to a decrease in grasses, forbs, and shrubs and an increase in the severity of fires.

Non-Forested Uplands

BLM Administered Lands - ("The Gerber Block")

Previously in this document, the differences between existing conditions (Step 3) and reference conditions (Step 4) have been discussed. The Non-Forested Uplands" and Human Uses – Grazing" sections have jointly outlined the history and effects of high grazing pressures within the analysis area - including the effects on the vegetation communities - prior to passage of the Taylor Grazing Act (TGA) in 1934. Also briefly described were the post-TGA controls and management that have been implemented over the past 65 years that have lead to ubiquitous improvements in rangeland vegetation conditions, albeit variable in scale. This section will bring together ("synthesize") all the Step 3 and 4 upland vegetation information, add some information and discussions about rangeland vegetation monitoring studies (though most of the monitoring information is covered in this Step under "Human Uses – Grazing"), analyze the information sufficient to arrive at cause and effect conclusions, and interpret the significance of the conclusions. The information in this Step will lead into the management recommendations to be put forth in Step 6.

This section on non-forested upland vegetation will address the assortment of broad vegetation communities present in the Gerber Block with minimal regard to allotment boundaries. The Step 5 section "Human Uses – Grazing" will also expand somewhat upon the information found here by addressing ecological conditions on an allotment specific basis. Since a grazing allotment is the basic "unit" for grazing management, it is necessary to address conditions within the boundaries of the allotments. This will result in some redundancy, as it is difficult to disconnect the vegetation conditions analysis from the grazing use and rangeland monitoring analysis.

Information outlined by allotment is also necessary because this analysis will include complete "Rangeland Health Standards Assessments" for 8 allotments in the watershed analysis area. This information must be allotment specific at some point so that a "met" or "not met" determination can be made and allotment specific management formulated. The combination of both Step 5 sections should paint a picture of vegetation condition and trends that helps to focus management on the areas that need additional or changed management, and as importantly, where current management is appropriate and should be continued.

As noted in Step 3, the Ecological Site Inventory (ESI) determined that vegetative conditions for the uplands (and most meadows) in the Gerber Block are proportionally as follows:

Condition Classes	% of total classified
Potential Natural Community (PNC)	28.6%
Late Seral	53.7%
Mid Seral	17.1%
Early Seral	0.6%

In general, it is thought that all of the vegetation communities in PNC, and probably all of those in Late Seral, have properly functioning plant communities, which implies overall proper functioning biotic and physical conditions. Proper functioning can be thought of as a state or condition where the majority of the rangeland health attributes or ecological processes are functioning similarly to the ecological site description parameters, to an appropriate ecological reference area, or other suitable benchmark - given the normal range of variability associated with the site and climate. The "normal range of variation" is defined as "...the deviation of characteristics of biotic communities and their environment that can be expected given natural variability in climate and disturbance regimes". (USDI-BLM 2000) Ecological processes include the water cycle (the capture, storage, and redistribution of precipitation), energy flow (conversion of sunlight to plant and animal matter), and nutrient cycle (the cycle of nutrients such as nitrogen and phosphorus through the physical and biotic components of the environment).

Ecological processes functioning within a normal range of variation will support specific plant (and animal) communities. Direct measures of site integrity and status of ecological processes are difficult or expensive to measure due to the complexity of the processes and their interrelationships. Therefore, biological and physical attributes are often used as indicators of the functional status of ecological processes and site integrity. The plant communities in the analysis area are defined by the Ecological Site Descriptions – BLM accepted benchmarks for vegetation community comparison. A comparison of the current vegetation composition to the Ecological Site Description parameters is our primary indicator method for determining ecologic integrity.

The following narrative is ecological site specific and based on the above premises and assumptions. (Also, see the Step 5 "*Human Uses – Grazing*" section for allotment specific ESI information on vegetation types and conditions. That section includes a summary of rangeland monitoring information; information that can help to explain some of the analysis and interpretations presented in this section.)

Meadow Communities

a. **Dry Meadow** (0.8% of surveyed area) - The ESI identified 865 acres of Dry Meadow ecological site scattered in small parcels throughout the Gerber Block. 8% was PNC, 69% Late Seral, 19% Mid Seral, and 4% in Early Seral. These sites have historically received above average grazing use by livestock due to herbaceous productivity, typical proximity to water, and little slope. Fortunately, most of this site (77%) is in Late Seral or better condition, where due to the higher effective moisture, the opportunities for condition improvement (i.e. upward trends) are high with appropriate grazing management. The lack of slope probably limits the erosion potential somewhat, though this site is often found near a drainage way where the benefits may be muted by the proximity of high spring flows and/or increased grazing pressure.

Some of the mid seral sites were "down graded" due to the encroachment of otherwise desirable plants - like single-spike oatgrass (*Danthonia unispicata*) and other sedges/rushes - that are not accounted for in the ecological site description and as such are not "counted" in the numerical condition rating. The plant diversity is a function of the transitional nature of meadow sites between upland and riparian vegetation and its nature as somewhat of a "catch all" description for transitional sites that don't fit elsewhere (see Step 3). These mid seral areas are considered functional in the sense that adequate, appropriate, plant cover is present to minimize erosion and provide relatively stable conditions. The one small early seral area is an old breached (dike broken) reservoir in the Horsefly allotment where the weed-dominated condition is a function of the reservoir's inability to retain water. (This old reservoir site was probably a small spikerush meadow during pre-settlement days (next section) but was irreversibly altered by the dike.) Overall condition trends within this ecological site are variable, but are generally static to upwards, based on ESI observations. Overall, this site is functioning adequately with current management.

b. **Ephemeral Lakebed** (1.8% of the surveyed area) - This ecological site was found on over 2000 acres in the Gerber block, though there is also a large amount of this type on inholding private lands that were not ESI surveyed. Virtually all (92%) of the Ephemeral Lakebed areas in the Gerber Block are classified as PNC, with the rest (8%) in late seral condition class. All of the Ephemeral Lakebed areas have historically received higher than average grazing pressure for the same reasons listed for the Dry Meadow ecological site. However, spikerush is an exceptionally resilient native species that is largely immune to livestock grazing pressure, as long as the lengthy seasonally saturated conditions persist and it is not grazed season long (though many of the private lands are grazed throughout much of the season and the spikerush persists). Current conditions and functionality are compatible with current management. Vegetation trends are static at these sites since the vegetation is already in elevated ecological condition with little room for improvement.

c. **Semi-Wet Meadow** (<0.1% of surveyed area) - As noted previously (Step 3), this ecological site is a rare vegetation component in the Gerber Block (total of 28 acres) and too small to be specifically managed for. The only classified site in the Gerber Block was rated as PNC and considered functional and stable.

Shrub/Bunchgrass Communities

a. **Low Sagebrush Dominated Communities** – As noted in Step 3, low sagebrush is by far the most abundant shrub species in the Gerber Block reflecting the naturally shallow soils. Four ecological site descriptions cover all of the non-juniper, low sagebrush vegetation types, though the first two described below cover 97% of low sagebrush classified acres.

<u>Shallow Stony 10-20"</u> (18.1% of surveyed area) - This is the most common of the non-juniper, sagebrush dominated ecological sites in the Gerber Block, with almost 20,000 acres classified. Of this total, the ESI classified 11% as PNC, 85% as late seral, and the remaining 4% as mid seral. Since these sites are very thin soiled and often very rocky, they have very limited production potential and typically a large percentage of the area has no vegetation (i.e. rocks, gravel, bare ground, etc.). As such, these sites often appear to the uninitiated to be in poorer condition than they actually are. The PNC areas, by definition, are as good of vegetation communities as these sites can support or attain and are assumed to be fully functional. These areas have very limited potential for juniper invasion due primarily to the thin soils and possibly springtime inundation.

The late seral communities are believed to be at least adequately functional and usually within the normal range of variation that would have been found on these sites during pre-settlement times. It would be expected though, that the late seral areas might have more risk of functionality problems if improperly managed (e.g. over-grazed). The ESI determined apparent trends were typically static and the erosion condition class determinations (Soil Surface Factor or SSF) tended to be in the slight to moderate range. The Shallow Stony areas tended to have some of the higher SSF ratings found in the Gerber Block. These relatively elevated ratings are thought to be partially a function of the high clay related natural "pedestaling" of the grasses and the limited production potential to supply litter – two of the five primary SSF rating categories. However, the natural lack of vegetation cover does appear to make these areas somewhat more vulnerable to erosion, though this is at least partially offset by the inherent rockiness. Fortunately, the typical slope of the Shallow Stony areas is 0% to 2%, with none found over 4%; a fact that indicates minimal risk of extensive water erosion. (In fact, these areas are typically totally saturated for several weeks in the early spring, with standing water in the open interspaces that appears to dissipate more by evaporation than runoff.)

The ESI classified all of the mid seral Shallow Stony areas (791 acres total) in the southwestern portion of the Gerber Block - primarily in the Adobe pasture of the Horsefly allotment, both pastures of the Bumpheads allotment, and the Woolen Canyon and Willow Valley Chaining pastures of the Willow Valley allotment. These areas will be discussed more in the "Human Uses – Grazing" section of Step 5, as it is better addressed in conjunction with the rangeland monitoring studies information. However, in short, these mid seral areas are intermingled with the larger expanses of mid seral Juniper Claypan 12-16" areas that are a result of the 1937 wildfire (discussed earlier) of which the effects are still apparent today.

<u>Stony Claypan 14-20"</u> (10.3% of surveyed area) - The Stony Claypan ecological site is also common throughout the Gerber Block, with over 11,300 acres classified. The ESI determined that 64% of this site was late seral and 36% was PNC; none was classified as mid or early seral. This site is 2 to 3 times more productive than the Shallow Stony ecological site due to the slightly deeper soils. Because of this higher production potential the Stony Claypan sites probably have more natural resiliency than the Shallow Stony sites, though they both have similar rockiness and slope. The late seral areas as well as the PNC sites are all thought to be fully functional due to the diversity and abundance of the vegetation – particularly the high

levels of native perennial bunchgrasses – and the relatively high production and ground cover levels. The ESI found the apparent trends all static to upwards and the erosion condition class (SSF) to be slight; both indicators of appropriate current management. One possible area of concern is that the Stony Claypan ecological site does have moderate potential for juniper encroachment, which is occurring in some areas. However, as noted in Step 3, due to the similarity between the Juniper Claypan and Stony Claypan sites, it is difficult to differentiate an invaded Stony Claypan site from a Juniper Claypan with younger trees (i.e. due to removal by past wild fire).

<u>Claypan 14-20" & Claypan Bottom 12-18"</u> (1.0% of surveyed area) - Both of these ecological sites are found infrequently in the Gerber Block but are enough alike to be considered together as they occupy similar locations on the landscape. In combination, the two sites total 1045 acres in the Gerber Block, which is broken down into the following ecological condition classes: 21% PNC, 66% late seral, and 13% mid seral. Both of these types are typically found near - and are very similar to - the Stony Claypan ecological site described above. They also have approximately the same productivity potential. The condition and functionality statements for the Stony Claypan in PNC and late seral hold true for these two sites also, with the exception that the Claypan and Claypan Bottom sites have almost no surface rockiness.

All of the mid seral acres (139) were ESI typed in the Copeland pasture of the Horsefly allotment, north of Copeland Reservoir. The vegetation actually classified as late seral, but was downgraded to mid seral due to lower than average production. The diminished production is likely due to historic use and juniper invasion. This area is very close to water and probably received high, extended season grazing use prior to the current short duration rest-rotation grazing system. This site is not considered of significant management concern due to its limited area, lack of slope, largely acceptable vegetation community composition, probable upwards trend, and the fact that the majority of this pasture (79%) is in PNC or late seral.

In general, juniper encroachment is a minor (Claypan Bottom) to moderate (Claypan) concern on these sites. But because of the limited area of both, it is not a major issue, though some increases were noted during the ESI. Condition trends in these sites appear to be largely static based on ESI observations; consistent with the majority of these sites being in elevated ecological status.

b. **Big Sagebrush/Bitterbrush Dominated Communities** (totals 2% of surveyed area) Mountain big sagebrush and antelope bitterbrush are commonly found throughout the Gerber Block, but both are rarely abundant enough to define an ecological site. They primarily exist as minor components of other, deeper soil, ecological sites - particularly the pine sites.

<u>Shrubby Loam 16-20"</u> (0.8% of surveyed area) - This relatively scarce ecological site is found sporadically within the central and northern portions of the Gerber Block. The ESI classified 842 acres as this ecological site; 91% was in late seral with the remainder (9%) mid seral. The late seral areas typically have a healthy mix of proper plant species with high production. Late seral sites are considered functional, though encroachment of juniper - which will crowd out the desired site typical shrubs and grasses (in that order) - is a major concern. In fact, these sites have some of the highest potential for undesirable juniper invasion of any in the area and need to be closely monitored, since in the absence of juniper control, these sites will slowly degrade over time regardless of the grazing use.

The mid seral condition site was located in the Dry Prairie allotment scattered between the Campground, Ben Hall, and Dry Prairie pastures. This area actually ranked out as late seral, but was rated down due to suppressed production, which appears to be the result of two factors. The first is the juniper invasion crowding out the more desirable native perennial grasses, and in particular, the big sagebrush, bitterbrush, and mountain mahogany. The other factor is that this area is just north of Ben Hall Creek, where prior to the current grazing management (which includes the rest-rotation system with separately fenced riparian pastures on the creek), cattle congregated and inevitably heavily grazed the area. Since the creek is now separately fenced, the livestock are not negatively impacting the area anymore (based on use pattern mapping), though the juniper increases are an ever-continuing problem.

<u>South Slopes 14-18"</u> (0.9% of surveyed area) - The South Slopes ecological site is found in the central and southern portions of the Gerber Block. During the ESI, almost 1000 acres were classified. Most (81%) of the South Slope sites were determined to be in mid seral condition, with smaller amounts in late seral (9%) and PNC (10%). These latter condition classes would be considered fully functional.

As noted in Step 3, the mid seral condition sites in the Gerber Block have the following characteristics: a relatively high canopy cover of invasive juniper; relatively low production, which at least partially reflects the juniper competition; and a herbaceous understory that has a relatively high percentage of weedy species like cheatgrass, willow herb, medusahead, and others. As the name implies, these sites are situated on south facing slopes, which is the driest landscape setting. These sites are chiefly located in the areas known to have historically (late 19th and early 20th centuries) received high levels of grazing use from uncontrolled sheep, cattle, and horses. Since these south facing sites warmed up first in the early spring, the earliest plant growth commenced here, resulting in the earliest herbaceous "green-up" areas which attracted the first grazing pressure of the season. Grazing certainly continued throughout the season with the south slopes the last to be snow covered in the late fall/winter. This sustained, heavy grazing pressure resulted in apparent soil loss and also reduced the competitive advantage of the site typical grasses and shrubs, allowing juniper to encroach. Even though the ESI rated these areas with static to upward trends, the current combination of drier conditions, juniper and annual plant invasion, and likely past soil loss, may not allow vegetative conditions to ever fully restore - like the known condition improvements that occurred on the adjacent cooler and higher effective moisture areas. However, due to the apparent upward tends, limited spatial distribution of this site, historically diminished grazing pressure, and appropriate current grazing management (i.e. rest rotation grazing systems), these areas are of limited management concern.

<u>North Slopes 14-18"</u> (0.1% of surveyed area) - This is the only ESI defined bitterbrush dominant site, though the Shrubby Loam site has it as a co-dominant. The North Slope ecological site was only classified in one location in the Willow Valley allotment below Willow Valley Reservoir – a total of 78 acres. It was found to be in late seral condition with an apparent upward trend and would be considered as proper functioning.

c. **Mahogany Communities** – As discussed previously, mountain mahogany is a common, though rarely dominant species within the Gerber Block. It is commonly found as a significant component in the juniper and pine ecological sites, with a particular affinity for the deeper soil, mixed tree areas (i.e. pine and juniper together). However, one ecological site is defined by mountain mahogany - the <u>Mahogany Rockland 10-20"</u> (0.2% of the surveyed area or 173 acres). This is a highly variable site depending on landscape position, topography, slope, aspect, and rockiness. During the ESI, this ecological site was found throughout the analysis area, though usually as very small, unmeasured inclusions in the pine and/or juniper dominated areas. All of the specific ESI classified acres were in late seral condition, which is thought to be a fully functional plant community on these sites.

Current livestock grazing management in these areas is considered a negligible condition factor due to natural factors (topography, limited forage, and/or rockiness), which discourage extensive livestock use. Fire exclusion and more distantly past grazing pressures were probably the major factors allowing juniper densities to reach site atypical levels. The increase in juniper has apparently been the primary cause of the reduction of mountain mahogany as a significant sub-component in the pine/juniper sites; a concern that was discussed in Step 3.

Juniper Communities

True western juniper potential vegetation communities (versus communities with invasive juniper) make up the largest single class of ecological sites within the BLM managed portions of the analysis area. The ESI classified approximately 50,000 acres within 5 juniper potential ecological sites, though 88% of the acreage fell within the first two Juniper Claypan ecological sites described next.

<u>Juniper Claypan 12-16"</u> (15.3% of surveyed area) - This ecological site is the dominant old growth juniper site in the southwestern and south central portions of the Gerber Block. This site has the widest latitude of current ecological conditions with 27% in PNC, 31% in late seral, 38% in mid seral, and 4% in early seral. In fact, this Juniper Claypan site accounted for 94% of all the early seral vegetation and 63% of the non-pine, mid seral vegetation. The reasons for these depressed ecological conditions were covered in Step 3, though some bears reiterating here.

Both the PNC and late seral areas are thought to be as functional as these sites can attain. As noted in Step 3, many of the PNC and late seral areas have good plant species diversity, but lower than site typical production. These low production/high seral state communities are actually thought to be an indicator of the ecological condition improvements made since the pre-Taylor Grazing Act (1934) grazing abuses that resulted in significant and irrevocable loss of the already shallow soils. The natural vegetation composition has and continues to be properly re-establishing, but the higher productivity potential was permanently lost with the soil. (Similarly, all of the early seral areas actually classified as mid seral condition, but were downgraded due to low production.)

The mid and early seral communities are found largely within the previously noted 1937 wildfire area. The south Gerber Block is also believed to have received some of the highest, pre-Taylor Grazing Act (TGA), grazing pressures of all the BLM administered lands. Since the TGA controls were just being implemented on the ground in 1937, these areas were still being variably overgrazed and in poor condition from decades of abusive grazing pressure. After the 1937 fire, these areas were probably still being heavily grazed, though at levels less than pre-TGA. These pressures in combination, led to soil and vegetation resource impacts that were extreme enough so as site productivity and potential were permanently compromised. The area's current grazing management with its emphasis on multi-pasture rest-rotation systems, has and will continue to help these plant communities restore their diversity of native species over time. However, this will be a slow process and, practically speaking, site productivity will never return to its pre-settlement condition. Given all this, management of these areas is believed appropriate and adequate at this time; future rangeland monitoring studies and/or ESI re-surveys would determine when additional management changes would be needed.

Both Juniper Claypan sites – this and the following moister site – as well as the other minor juniper sites, are experiencing variably increased levels of juniper density atypical for these sites (i.e. as compared to pre-European settlement). Though juniper is a natural component of these ecological sites, the combined effects of long term fire suppression and past heavy grazing pressure have allowed juniper to increase in density beyond the presumed natural range of variation. At this point in time, the increase has not significantly degraded the condition of the two dominant (Juniper Claypan) ecological sites as classified by the ESI. However, the trends are distinct and juniper will become an ever-increasing concern over the next few decades (see Step 6).

<u>Juniper Claypan 16-20"</u> (23.8% of surveyed area) - This ecological site is the dominant old growth juniper site in the northern and eastern portions of the Gerber Block. It is also the most abundant ecological site in Gerber Block; comprising almost one quarter of the total ESI classified acreage (over 26,000 acres). This site also has some of the most elevated ecological conditions of any in the Gerber Block with 66% in PNC, 31% in late seral, and only 4% in mid seral. In fact, this ecological site accounts for 55% of all the classified PNC acres. These excellent ecological conditions – as compared to the Juniper Claypan 12-16" site above - are probably due to the additional 3-4" of average precipitation that these slightly higher elevation areas receive, and possibly due to the generally less southerly aspect. The Juniper Claypan 16-20" areas also received high levels of pre-TGA grazing use, but probably less than did the more southern areas. In hand with the

additional resiliency due to the increased moisture, these areas have faired better ecologically. The ESI found the late seral and PNC areas to have static to upward trends and both are thought to be fully functioning plant communities. Current management appears appropriate for maintaining these elevated ecological conditions.

The mid seral areas were found to have late seral species diversity, but significantly suppressed production, resulting in the lowered rating. These areas are primarily located just below the south end of Goodlow Rim, in the extreme west central portion of the Gerber Block, immediately adjacent to private ranch lands (primarily in the Adobe pasture of the Horsefly allotment). Unlike the mid and early seral Juniper Claypan 12-16" areas, this area was not part of the 1937 burn area. Instead, it was (and still is to a lesser degree) a major trailing conduit for livestock coming into and leaving the BLM grazing lands. However, like the mid-seral Juniper Claypan 12-16", this area inevitably received very high grazing pressures during the early, unregulated grazing days, which resulted in a permanent degrading of ecological potential due primarily to soil loss. However, monitoring studies in recent years has shown this area's grazing utilization to be relatively light and these areas appear to have very slow, upward condition trend. The current rest-rotation grazing system is thought appropriate to continue the trend towards reaching whatever level of optimum functionality this site can still attain.

<u>Juniper Loamy Hills 10-14"</u> (1.6% of surveyed area) - This ecological site is found only in the extreme southwest corner of the Gerber Block and entirely within the Willow Valley Chaining pasture of the Willow Valley allotment (see Step 3 for more information). This site totaled 1762 acres. The chained/seeded area - which makes up 59% of this site's acreage - is in "good" condition for a seeding. A good condition seeding is the functional equivalent of late seral for native communities, except it is based on percent of the desired forage species. The primary objective for the Chaining continues to be providing forage for both the migratory deer herd and livestock grazing. Recently, additional manipulation of the Chaining has occurred as follows: it was partially prescribed burned during the fall of 1998; planted with thousands of bitterbrush seedlings during the spring of 1999 and 2000; and a large amount of the post-chaining juniper reproduction was hand cut during the fall of 2000. The end result of all this activity was to increase the amounts of perennial grasses - the native species and the seeded wheatgrass; effect a significant decrease in less desired brush species (sagebrush and rabbitbrush); and gain a major increase in small bitterbrush plants. The ultimate success of the bitterbrush planting is impossible to judge at this time, but much of it still survives in most planted areas.

In the 41% of this ecological site that was not chained, conditions were rated as mid seral. The species diversity and proportions rated the area in the lower end of the late seral condition class, but like the mid seral Juniper Claypan sites, the ultimate rating was downgraded to due to low production. This lessened production is a function of the often-noted heavy livestock grazing in the early settlement days – stresses that led to soil loss and created the conditions for weedy annual forbs, grasses, and a site atypical overabundance of juniper to dominate the site. Portions of this area were also burned in the 1937 wild fire. These mid seral areas are probably what the Chaining area looked like prior to treatment. Monitoring and evaluation of this area in recent years (the Willow Valley Rangeland Health Standards Assessment was completed in 2000) has shown that livestock make little use of these non-seeded areas and are not a significant factor in their continued depressed condition. These areas probably have been altered to the point that recovery is not possible, regardless of any practical management that could be applied. Fortunately, these type areas in relatively poor condition are a very small percentage of the Gerber Block – in this case <0.7%.

<u>Juniper-Mahogany-Fescue 16-20"</u> (0.3% of surveyed area) - This ecological site is almost identical to the next described site, except that ponderosa pine is absent. Most of this site was ESI rated as late seral condition (84%) with the rest (16%) mid seral – a total of 356 acres. It occurs as either a transition type between a Juniper Claypan and adjacent pine dominated site or is found along the base of the low, basalt escarpment rims common in the Gerber Block. Due to the similarity to the next site, similar condition class, and this site's rarity, the following discussion will suffice.

Juniper-Dry Pine 14-16" (3.6% of surveyed area) - This ecological site is the driest of the sites with a ponderosa pine component and occurs in the southeast and south central portions of the Gerber Block. All of the Juniper Dry-Pine sites (4000+ acres) were ESI classified in late seral condition. These areas have been extensively underburned in recent years, causing a short-term suppression of ecological conditions, due primarily to a reduction in native shrub species. Long term as the shrubs re-establish (a 10-20 year process), this burning should have a neutral to positive effect on site conditions. These areas have also had a history of timber harvest activities and have experienced the die-off of mountain mahogany in the understory, discussed in Step 3. Because of the juniper problems, these areas are prime candidates for juniper control activities. Outside of the juniper issue, the late seral plant communities currently found on these sites are thought to be at least adequately functional given the current management.

Pine Communities

As noted before, the true pine sites are more comprehensively addressed in the Forested Uplands section and will only be addressed to a limited degree here from the perspective of the ESI data. (Note: As discussed in Step 3, the ESI is of only limited utility as a vegetation classification system in forested areas.)

Pine-Mahogany-Fescue 16-20" (6.1% of surveyed area) - This ecological site is a distinct transition between the true pine and old juniper potential areas. The ESI rated 92% of these sites as late seral, with 8% PNC, and <1% mid seral. In late seral condition class, younger juniper (i.e. <100 years old) is often an increasing component and the mountain mahogany has significantly decreased - not coincidentally, as noted previously.

Pine-Sedge-Fescue 16-24" (14.8% of surveyed area) - The Pine-Sedge-Fescue ecological site is the most pine dominated one within the BLM's Gerber Block, occupying the deepest soil, non-meadow/riparian areas, and one of the more abundant ecological sites. The ESI rated these sites almost equally between late seral (47%) and mid seral (53%). However, virtually all of the mid seral areas actually ranked out as late seral by plant species composition, but downgraded due to lowered production levels (see Step 3).

Both of the above pine sites have been the primary targets of the Resource Area's prescribed burning program. The primary ecological impact of this extensive burning has been a significant diminishment of the non-resprouting shrubs (most shrub species) - plants that appear to take 10-20 years to significantly re-establish. In addition, most of these sites have had some level of past timber harvest. This has also contributed to the decrease in the understory as a consequence of the timber harvest methods and post-harvest reclamation activities. Many of the pine stands have had both timber harvest and burning occur, which in combination, have pushed a large percentage of the Pine-Sedge-Fescue sites into the mid seral condition class. Unlike the juniper and sagebrush/bunchgrass areas, historic livestock grazing appears to have been a limited factor in the condition of the Pine sites. Utilization pattern mapping generally shows little use of the pine sites by cattle, largely because they have limited forage resources. The majority of the areas classified in the two pine sites were estimated during the ESI to have upward trends. This was principally because post-burning/harvest, the herbaceous and shrub understory species have nowhere to go but upward (i.e. increasing in diversity and abundance). Functionality of these sites is thought to be at least adequate with current management; see the *Vegetation-Forested Upland* section for more information.

FS Administered Lands - Fremont National Forest

Livestock grazing has contributed to the alteration of non-forested vegetation in the watershed by interrupting ecological plant succession. Grazing has moved some plant communities toward early-mid seral conditions (rated as poor condition) while other communities have quickly moved toward late succession (rated as excellent or good condition). This is observable from condition and trend data (Table 5-8).

Table 5-8. Vegetative condition and trend on a site-specific basis by allotment in the Gerber watershed.

Allotment	Location	Ecological Class	Year[1]	Forage Rating	Trend
Arkansas	T39S R16E Sec 21	Wet Meadow	1970	Fair	↓
Barnes Valley	T39S R15E Sec 16	Dry Meadow	1991	Poor	↑
Barnes Valley	T39S R15E Sec 8	Low Sage[2]	1990	Fair	→
Barnes Valley	T39S R15E Sec 3	Dry Meadow	1991	Poor	↓
Barnes Valley	T39S R15E Sec 19	Juniper[3]	1990	Fair	→
Bly Ridge	T36S R13E Sec 24	Juniper[3]	1990	Fair	↑
Bly Ridge	T37S R13E Sec 6	Moist Meadow	1989	Good	→
Horsefly	T38S R15E Sec 10	Wet Meadow	1989	Fair	↑
Horsefly	T38S R15E Sec 4	Low Sage[2]	1989	Good	→
Horsefly	T37S R13E Sec 24	Low Sage[2]	1989	Good	↑
Horsefly	T37S R13E Sec 25	Wet Meadow	1989	Good	→
Horsefly	T38S R13E Sec 7	Wet Meadow	1989	Good	↑
Privy Spring	T38S R13E Sec 7	Low Sage[2]	1991	Poor	↑
Pitchlog	T39S R15E Sec 22	Low Sage[2]	1990	Fair	→
Yainax	T38S R12E Sec 29	Juniper[3]	1985	Fair	↑
Bear Valley	T40S R16E Sec 2	Low Sage[2]	1971	Good	↑
Dent Creek	T39S R16E S 3	Moist Meadow	1982	Poor	↓
Fort Spring	T41S R15E Sec 14	Low Sage[2]	1964	Poor	→
Wildhorse	T41S R16E Sec 16	Meadow	1964	Fair	→

[1] Most recent year condition and trend monitoring was performed at each site
[2] Low sagebrush/ Fescue-Squirreltail
[3] Juniper/Low Sagebrush/ Fescue

Condition and Trend Data

Range vegetation condition and trend analysis is based on succession and community dynamics (Table 5-8). Condition and trend are used to assess whether specific range sites within the allotment are at or depart from accepted standards and capabilities based on their potential for production. Range condition relates the current production and composition of the vegetation to the potential plant association for a given range site and is given a rating of excellent, good, fair, or poor. Trend is the direction of change whether stable (static), toward (upward), or away (downward) from the site's potential and is rated as such.

In summary, forage ratings showed 32% of the sites measured were in good condition, 42% in fair condition, and 26% in poor condition (Table 5-8). Apparent trend showed, of the sites measured, 42% were moving toward site production potential, 42% were static, and 16% were moving away from the site production potential. Without an ecological status evaluation, my guess that the majority of sampled areas are moving toward climax or late-seral successional stages, is not well documented. The ecological status of sites will be performed under the scheduled range analysis and will give us the degree of departure from climax in the watershed.

Some of these changes in plant communities have been caused by uncontrolled numbers of livestock and season long use in the allotments. Overgrazing in the past is an example of what originally altered and degraded the rangeland in the watershed. This historical management strategy led to problems evident today, such as down cut riparian systems and increases in shrub cover. Not until the 1960's did the main portion of the watershed divide up into separate pastures, which enabled tighter control of livestock numbers and season of use that has allowed range conditions to improve. Other changes occurred due to the aggressive and competitive ability of introduced grass species such as Kentucky bluegrass (*Poa pratensis*) and downy brome (*Bromus techtorum*) to out-compete native grasses. These introduced species can quickly vegetate disturbed areas and prevent the establishment of native grasses thus changing the community dynamics and diversity. Fire suppression and a lack of reoccurring low intensity high severity fires has promoted the growth of sagebrush (*Artemisia spp*.) and Juniper (*Juniperus* spp.) decreasing forage production for livestock.

Noxious Weeds

Since all of the noxious weed species that occur within the watershed are exotic (introduced) to North America, noxious weeds were not present in the watershed during reference times. At the end of the reference time period, domestic livestock grazing, logging, road construction, timber harvest and other Euro-American ground disturbing activities led to the introduction and establishment of noxious weed species in the watershed. Established weed populations, domestic livestock grazing, logging, road construction, timber harvest, recreationists, and the resulting increased vehicle traffic in the watershed are contributing to the current spread of noxious weeds. Many of the existing populations are isolated, which helps to facilitate control, however, the potential for spread is high for many of these species.

The objective of the noxious weed management program on BLM lands within the analysis area is to contain or reduce noxious weed infestations using an integrated pest management approach. Integrated pest management includes manual, mechanical, chemical, and biological control methods which are used in accordance with the Klamath Falls Resource Area Integrated Weed Control Plan (IWCP) and Environmental Assessment (EA)(OR-014-93-09), which is tiered to the Northwest Area Noxious Weed Control Program Environmental Impact Statement (EIS) (December 1985) and Supplement (March 1987).

Threatened, Endangered, and Sensitive Plant Species

Special status plant species have been affected directly by domestic livestock grazing, logging, road construction, timber harvest and other Euro-American ground disturbing activities, and indirectly by changes in vegetation structure related to these ground disturbing activities and disruption of ecosystem processes including natural disturbance factors such as fire.

The long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*) grows in areas which produce forage that is attractive to livestock. Therefore, long-bearded mariposa lily has most likely been reduced in abundance and distribution due to the impacts of livestock grazing and other human activities.

Baker's globe mallow (*Iliamna bakeri*) seems to be adapted to frequent fire. Therefore, fire suppression, both directly and indirectly through consumption of fine fuels by livestock, has reduced habitat for Baker's globe mallow. However, timber harvest practices that open the canopy in these forests may have partially offset these impacts to some extent. Overall it is likely that Baker's globe mallow has been somewhat reduced in abundance and distribution relative to reference conditions due to the impacts of fire suppression, livestock grazing and other human activities.

Blue-leaved penstemon (*Penstemon glaucinus*) populations, which are adapted to natural disturbance in the lodgepole pine forest type. As the overstory canopy closes in, habitat quality for blue-leaved penstemon declines since this species is detrimentally affected by lower light levels and competition from other species when disturbance regimes are disrupted allowing canopy cover to exceed 40% (Wooley 1992). Therefore, fire supression, both directly and indirectly through consumption of fine fuels by livestock, has reduced habitat for blue-leaved penstemon. However, timber harvest practices that open the canopy in these forests may have partially offset losses of habitat due to other human activities.

Profuse-flowered mesa mint (*Pogogyne floribunda*) grows in seasonal (vernal) wetlands characterized by silver sage (*Artemisia cana*). The additional moisture produced forage that would attract livestock to these sites. Therfore it has probably been reduced in abundance and distribution relative to reference conditions due to livestock grazing and other human activities. Suveys of similar habitats in the Gerber area have not documented additional populations.

Fringed campion (*Silene nuda* ssp. *insectivora*) is found in relatively deeper soils of the sagebrush-steppe habitat, often associated with vernal streams and washes. The deeper soils and additional moisture produced forage that would attract livestock to these sites. Therefore, although fringed campion is probably somewhat tolerant of disturbance, it is probably been reduced in abundance and distribution relative to reference conditions due to livestock grazing and other human activities.

Special Areas

At the end of the reference time period, land ownership patterns, domestic livestock grazing, logging, road construction, timber harvest and other Euro-American ground disturbing activities led to fragmentation of the landscape and disturbance of the ecosystem processes which support native plant communities on the landscape. Recognition of the effects of Euro-American settlement led to the perception that reference areas were needed with which to compare the more intensively management landscape, and certain resource values were deserving of special management in order to maintain those values on the landscape.

Consequently, Research Natural Areas (RNA's) were established to preserve and protect examples of relatively undisturbed biological communities and the ecological processes that support those communities. These areas are available for short- or long-term scientific study, research, and education, and serve as a baseline against which human impacts on natural systems can be measured.

Areas of Critical Environmental Concern (ACEC) were designated to highlight an area where special management attention is needed to protect and prevent irreparable damage to important historic, cultural or scenic values; fish or wildlife resources; or other natural systems or processes; or to protect human life and safety from natural hazards. Both ACEC's in the analysis area were designated to conserve natural processes or systems and other biological values.

Similarly, the special botanical area within the analysis area was designated to protect and maintain a specific remnant plant community.

Fire and Fuels

BLM Administered Lands

Perhaps the greatest influence on the evolution of vegetation in the arid western United States was the frequent fire regime that favored certain species and communities over others. Over time, the native vegetation communities shifted toward drought-tolerant, fire resistant species. Forests tended to be open and park like, brushfields burned on a regular basis, and perennial bunchgrasses dominated the grasslands. Native peoples added to the effect by setting frequent, low intensity fires (Agee 1993).

After European settlement, attempts to exclude fire, primarily through fire suppression, contributed to a trend toward higher stocking levels, a shift toward more shade-tolerant, drought intolerant species in the forested areas, and invasion of meadows and grasslands by woody species. Dense thickets of young trees are now abundant, biodiversity has declined, and human and ecological communities are more vulnerable to destructive wildfires. More live vegetation that provides ladder fuels, coupled with more woody debris collecting on the ground, has led to a situation where wildfires are becoming more intense, harder to control, and more likely to destroy everything in their path.

Ecological restoration efforts in the United States have recently been proposed for millions of hectares of public lands by federal, state, and local government agencies. These restoration proposals generally seek to thin forests with combinations of tree harvesting and prescribed burning to increase resilience to natural disturbance events such as fires, insects, and regional drought, and thereby reduce the risk of catastrophic fire events (Allen 2002). Rangeland restoration (mostly brush and grass species) is often addressed through local watershed analyses and Rangeland Health Standards Assessments, and usually includes juniper thinning and prescribed burning to restore historic vegetative communities.

There is a national consensus that it is urgent to restore more natural conditions to public lands (USDA & USDI, 2000). The local dilemma is to re-introduce fire into the ecosystem in a safe manner and with beneficial results to the resources. Reconstructed historic reference conditions are best used as general guides rather than rigid restoration prescriptions. Ecological restoration aims to enhance the resilience and sustainability of forests and rangelands through treatments that incrementally return the ecosystem to a state that is within an historic range of conditions, known as the "natural range of variability". In the long term, the best way to align forest conditions with ongoing climate changes is to restore fire, which naturally tracks with current climate. Some stands need substantial structural manipulation (thinning or mowing) before fire can safely be reintroduced (Allen, 2002).

Fire is not a precise or easy tool to use, and the fire manager must be extremely careful and proficient to obtain positive results. Efforts must include varying combinations of understory thinning and reintroduction of low-intensity fires. The BLM-Klamath Falls Resource Area has been working on this problem since 1980; averaging 2,350 acres of fuels reduction treatments on an annual basis (see Step 3). Due to the intensity of prescribed fires in certain vegetation types after 80 years of fire suppression, many acres were first treated by mechanical methods, which lessens the flammability of the stand, but does not imitate any natural process. The second treatment for those acres will apply fire to partially restore the ecological balance that is essential to the health of the watershed. After the third treatment, a 'maintenance level' will be achieved that will leave the landscape more fire-resistant and contribute greatly to ecosystem health. Care must be exercised in determining where fire is utilized. Some areas below 15" precipitation and below 4900' elevation can be highly susceptible to post-fire invasion by cheatgrass or other undesirable annual species. Refer to the discussion in the previous "Non-forested Upland Vegetation" section.

A successful restoration is one that sets ecological trends in the right direction. The challenge is to continue sustaining a more natural fire cycle even after the maintenance level has been reached. Since vegetation continues to grow and human intervention continues to expand, the time will never come when the watershed will stabilize and require no further management. At some future date, the most likely scenario is for natural fire starts to be managed to create desired conditions (allowed to burn as long as positive results are obtained). In the meantime, prescribed fires and mechanical treatment of fuels will be necessary to attain the desired future condition of vegetation in the Gerber/Willow Valley watersheds.

A variety of methods can be used to achieve a fire-resilient ecosystem. Treatment principles that develop forests and rangelands that are more adapted to fire are: reducing fuels on the ground (surface fuels), increasing the distance from the ground to the live crown on the trees, reducing crown density, retaining larger trees, breaking up the continuity of surface fuels, reducing the decadence of woody vegetation, and decreasing the encroachment of woody species into rangelands. Implementing one or more of these fire-resilient forest and rangeland principles could reduce the threat or decrease the negative effects of an unplanned wildfire event (USDI, 2003). Table 5-9 (adapted from Fitzgerald, 2002) displays common methods used to achieve these principles and their effects on forest stands, rangelands and grasslands. Any or all of these methods would be used where appropriate in the Gerber Block.

Table 5-9. Principles and methods of developing fire-resilient forests and rangelands.

Principle	Method	Effect	Advantage	Concerns
Reduce Surface Fuels in Forests	Burning of piles, crushing fuel, Rx burning.	Reduces potential flame length and continuity of fuels.	Control of fire is easier, improved safety for fire-fighters, less torching.	Surface disturbance, less with Rx burning than other techniques.
Increase Height to Live Crown	Thinning smaller trees and pruning up to 10-12 feet, either manually or with Rx fire.	Requires longer flame length before torching can initiate.	Less torching, improved safety for firefighters.	Opens understory, may allow surface wind to increase.
Decrease Crown Density	Thinning in combination with surface fuel reduction.	Makes tree-to-tree crown fire less likely.	Reduces crown fire potential, improves firefighter safety.	Surface wind may increase and surface fuels may be drier.
Retain Larger Trees	Thinning includes both spacing and diameter limits. Recognizes large trees are more fire resistant.	Retains thicker bark and taller trees that are more resistant to fire effects.	Increases survivability of trees.	Removing smaller trees is economically less profitable.
Break Up Continuous Surface Fuels	Construct fuel breaks and holding areas by mowing or crushing fuel, thinning, or Rx fire.	Reduces continuity of fuels to slow down rapid fire spread.	Control of fire is easier, improved safety for firefighters, less torching.	Surface disturbance, less with Rx burning than other techniques. Leaves much untreated fuel.
Reduce Decadence	Remove old, dying brush and small dead trees by mowing, thinning, or Rx fire.	Reduces available tinder- dry dead wood and leaves vegetation that is more resistant to ignition.	Fire behavior is less intense, improved safety for firefighters and less harmful to soil organisms.	Brush may not resprout after Rx burning, surface disturbance with mechanical methods.
Decrease Encroachment of Woody by Species	Remove young trees and brush mowing, thinning, crushing, or with Rx fire.	Retains more moisture on site and makes crown fires less likely.	Restoration of stable ecosystem improves firefighter safety.	Surface disturbance, compaction of moist soils.

USFS Administered Lands

Cost efficiency from a Fire Management perspective is measured by a net marginal benefit process (margin analysis) using expected loss. Expected loss is the cost of suppression, plus the net value change of an acre, times the probability of fire occurrence, computed annually for a chosen time period and discounted to Present Net Value. The Fremont National Forest typically uses a 20 year period for expected loss. Expected loss is directly proportional to fuel loading, fuelbed depth and fire occurrence.

In order to maintain a cost efficient fuel profile, 0-3" down woody material should not exceed an average of 10-12 tons per acre, based on current fire occurrence frequencies. When and if fuel loading exceeds this amount, fuel treatment alternatives will be considered and analyzed using a net marginal benefit process. Economically, the fuel treatment alternatives with the greatest net marginal benefit is considered the best.

Forest-wide Standards for Soils Management pertaining to fuel loading requires that 8-10 tons per acre of 0-9" down woody material should be left on site. If 10-12 tons of 0-3" down woody material is the desired fuel profile, there should be no problem meeting the Soils Management Standard of 8-10 tons of 0-9" down woody material.
The desired fuel profile used is an USFS—Region 6 custom fuel profile of a 4A that reflect 25 tons per acre of down woody material and a fuelbed depth of 0.56 feet. This is described in the National Fire Management Analysis System (NFMAS) reference Materials Handbook dated July 1, 1990.

III. Terrestrial Species and Habitat

Since European settlement of the analysis area, major changes in composition and diversity of habitat and associated wildlife species has occurred. Many of these changes have resulted in some species becoming less abundant and others becoming more abundant. Continued changes in habitat will further affect wildlife species in a variety of different ways.

Threatened, Endangered, and Sensitive Species

Bald Eagle - Over time, bald eagle foraging habitat has likely increased while nesting and roosting habitat has decreased. The watersheds may have provided more suitable forested habitat prior to 1950. Timber harvest, plant succession and fire suppression has reduced the abundance, distribution and quality of potential bald eagle nesting/roosting habitat on the landscape since 1950. Overstory removal, partial removal and regeneration timber harvest treatments in LOS ponderosa pine have removed preferred nest/roost trees. Fire suppression has resulted in increased stand densities, which has contributed to the mortality of the large overstory trees. Such trees are preferred by bald eagles for nesting and roosting. In some areas, the current trend of large tree mortality due to high stand densities and insects and disease must be reversed if potential nesting/roosting habitat is to be maintained through time. In other areas, recent management of ponderosa pine stringers, clumps and stands for LOS condition has improved this habitat for the future. In addition, plant succession is causing a change from true pine to mixed conifer in many stands. Mixed conifer stands are less suitable for bald eagle nesting/roosting. Prey habitat suitability was marginal within the watershed during the historic time period (USFS, 2000).

Populations in the watershed have likely increased since pre-settlement times. Roosting habitat quality has declined where open, park-like LOS pine stands have been replaced by dense, multi-story LOS stands. Habitat quality has declined since the 1940’s with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use.

Additional bald eagle nesting is possible as conifers near reservoirs increase in size. Potential eagle nesting and roosting habitat characterized by Isaacs and Silovsky (1991) in the watersheds is currently being managed for bald eagles.

American Peregrine Falcon - Potential nesting areas or suitable cliff sites within the analysis area have likely remained constant and relatively undisturbed. These sites could likely be occupied by peregrines in the future if associated foraging areas are suitable.

American peregrine falcon establishment is dependent upon prey availability of marsh-related species and terrestrial small mammals and birds. Marsh birds are most abundant during the wet cycles that occur about three of every ten years in southeastern Oregon. During drought years, waterfowl and shorebird numbers are low and any nesting peregrines would have to rely more heavily on small mammals and landbirds. Small mammal populations are cyclic with explosions and crashes. They currently appear to be rebuilding after a crash in population.

Wildfires maintained the upland prey habitat for peregrines prior to 1945. Fire suppression in recent years has allowed juniper to dominate sites and alter small mammal and bird habitat. Some open hunting areas have probably been lost due to juniper encroachment, making prey detection by peregrines difficult especially when small mammal populations are at low levels.

Habitat for prey species and foraging has improved where the removal of late and old seral (LOS) forest has increased the area of open, early seral forest cover types. Foraging habitat quantity and quality has declined where open, parklike LOS pine stands have been replaced by dense, multi-story LOS stands. Habitat quality has declined since the 1940's with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use.

Timber harvest has opened the forest canopy and gradually increased foraging habitat suitability in some forested areas. However, in the future, habitat for prey species and hunting would diminish if early and mid-structural stands progress in succession to an eventual overstory condition. Large created forage areas available for this species are not likely to occur in the future under predicted land management policies.

The possibility does exist that large forage areas will be created by wildfire. If current trends continue, large fires that remove forest overstory are likely to be more common in the decades ahead as the amount of acres in a dense vegetal state, with a high risk of stand-replacement fire, increases. Reductions in road densities could reduce disturbances and increase habitat security within potential habitat (USFS, 2000).

Northwestern pond turtle - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Habitat conditions for northwestern pond turtles in the watersheds have changed substantially over time. Historically, riparian areas were likely healthy enough to provide nesting and overwintering habitat in lower elevation areas of the watersheds. Elevational constraints and forage quality and quantity were probably always a limiting factor in pond turtle distribution.

With the creation of reservoir and other small impoundments, pond turtle habitat was likely improved. However in this same time period, riparian and associated water quality degradation probably limited pond turtle range expansion. In addition, the increased seasonal nature of the streams and reservoirs likely had detrimental effects.

Bats - There have been multiple changes to bat habitats within the watersheds. Some types of roosting and maternal colony sites have decreased in number and suitability, whereas others have increased. The number and distribution of snags and suitable live trees has decreased. This has detrimentally affected the species of bats that prefer these types of sites. Cliffs, caves and other rock structures have remained in a relatively unchanged condition, having little affect on bat species that use them. The increase in buildings and other structures has had beneficial affects on populations that have been able to adapt to these situations.

Bats species that prefer foraging around riparian corridors have been negatively impacted by degradation of these areas. However, species that typically feed over open waterholes, ponds or reservoirs have benefited from changes since European settlement.

Great Gray Owl - (BLM Survey and Manage Species, State Sensitive Vulnerable in Oregon) – Over time, great gray owl foraging habitat has increased while nesting and roosting habitat has likely decreased. The watersheds may have provided more suitable forested habitat prior to 1950. Timber harvest, plant succession and fire suppression has reduced the abundance, distribution and quality of potential great gray owl nesting/roosting habitat on the landscape since 1950. Overstory removal, partial removal and regeneration timber harvest treatments in LOS ponderosa pine have removed preferred nest/roost trees. Fire suppression has resulted in increased stand densities, which has contributed to the mortality of the large overstory trees. Such large trees with widely spaced limbs are preferred by great grays for nesting and roosting. In some areas, the current trend of large tree mortality due to high stand densities, insects and disease must be reversed if potential nesting/roosting habitat is to be maintained through time. In other areas, recent management of ponderosa pine stringers, clumps and stands for LOS condition has improved this habitat for the future. The number of broken top snags suitable for great gray owl nesting sites has varied through history. With current snag retention policies, snag numbers should remain stable in some parts of the watersheds.

Great grays have taken advantage of foraging area that has increased since the turn of the century. Clear cuts, patch cuts and existing openings and meadows are suitable for foraging. As clear cuts and patch cuts fill in with regenerating trees and shrubs, natural openings and meadows will become increasingly important for these owls.

Big Game

Seasonal big game ranges and migration corridors on private and public lands have been altered considerably within the past 50 years. Agents of change, including commercial timber harvest, fire suppression, wildfire, plant succession, livestock grazing, transportation corridors for public and industrial access and recreational developments have cumulatively altered the landscape. Drought, insects, and disease in recent years continue to cause additional modifications to all seasonal ranges and migration corridors in all ownerships.

Prior to Euro-American settlement, big game ranges were partially maintained by natural wildfires that created a mosaic of successional stages from early to climax. This provided the vigorous supply of winter browse, cover and early green-up grasses and forbs that is necessary for reproduction and survival.

Fire suppression since the early 1900's has acted as a habitat change agent and created an unnatural condition that has benefited browse species such as bitterbrush and mountain mahogany in the short-term. However, in the long term, this same protection from wildfire has created even-aged decadent stands of bitterbrush and mahogany with reduced reproduction and vigor. Fire suppression has also allowed western juniper to establish in areas where juniper was historically a minor component of the landscape. In the absence of natural wildfires, juniper has expanded at the expense of the understory shrubs and native herbaceous species. Natural fire regimes maintained stands in a mosaic of plants of various age classes and allowed vigorous growth and seedling establishment.

There has been a loss of riparian deciduous vegetation (willows, aspen and shrubs) and lowering of water tables in riparian zones as a direct result of overgrazing through the early 1900s. This in combination with insect infestations and resultant timber salvage operations has altered the abundance and distribution of fawning, calving and rearing cover and forage. The gradual current recovery of riparian vegetation, which is occurring around many stream and spring areas under present livestock management, should benefit deer and elk habitat.

The amount of effective cover is currently at optimum levels in most areas within the forested portion of the watershed. Distribution of cover, however, is poor resulting in large areas where cover is limited, thus reducing effective habitat. Since cover/forage ratios were not available for the historic condition, the relationship between historic and current cover/forage conditions is not specific. It can be assumed that more frequent fires historically allowed more herbaceous forage habitat in ponderosa pine habitats. Fire suppression throughout the twentieth century has caused a transition in stand structure from more open to more dense understories. This has increased hiding cover and reduced forage in historically open habitats. During the same period, timber harvest activities have reduced cover in higher elevation mixed conifer habitats. This has resulted in highly fragmented, patchy areas of cover where large, relatively unbroken tracts of cover existed historically. While forage areas were created by timber harvest activities, a continued creation of openings by harvest has not occurred on a large scale since the late 1980s. Many man-created forage areas have since reforested and are transitioning to a state of cover. Generally, thinning prescriptions within these openings allow for short-term retention of forage but act to retard the transition to cover. Eventually, canopy coverage begins to retard forage production and at the same time, tree density in the thinned stands is generally inadequate to provide cover. In this case, the value of the stand as mule deer or other big game habitat is minimized. Fire suppression has also precluded creation of short-term forage areas. If current trends continue, loss of forage would become even more pronounced in the next several decades as large-scale wildfires and insect outbreaks become the sole creators of forage habitat. Prescribed fire and understory thinning are tools that can be used to restore foraging habitat on a more predictable schedule. However, restoration of forage generally corresponds to a reduction in hiding, thermal and sometimes fawning/calving habitat (USFS, 2000).

Big game security has been reduced by increases in road densities in the past 50 years. Road prisms have reduced the amount of available habitat and vehicle traffic has displaced big game from areas adjacent to open roads. Roads have also increased vulnerability to harvest and poaching, further reducing big game security. Road closures and obliterations could increase habitat availability and security.

Mule Deer - Juniper encroachment is reducing the quality and quantity of transition range and winter range. Livestock grazing, drought cycles, and insect outbreaks have also negatively affected big game range. Intense livestock overgrazing in the early 1900s by domestic sheep, cattle and horses created severe competition with mule deer for early green-up grasses and forbs and winter browse. Drought cycles that occurred periodically further limited grass/forb production and browse seedling establishment. Insect infestations contributed to the decline of browse species by limiting flower and seed production and affecting the overall vigor of plants.

Maintenance of effective mule deer habitat at optimum or even minimum levels can conflict with management of forested stands for optimum sustainability. At some point, if historic LOS forest stand conditions are promoted on a wide enough landscape scale, ODF&W and Klamath Tribes management objectives for mule deer population numbers would be negatively impacted.

Elk - Elk populations will likely continue to increase within the watersheds as there is currently suitable summer and winter habitat. Removal of juniper will likely improve forage for elk as grasses and forbs respond to treatments.

Pronghorn - Juniper encroachment is reducing the quantity and quality of habitat, however other factors appear to be greater contributors to population trends. Pronghorns will likely benefit from low sage and shrub-steppe habitat improvements that revitalize the shrubs, grasses and associated forbs in these areas.

Terrestrial Species Associated with Late /Old Growth Successional (LOS) Habitat

Fuels buildup due to fire suppression and forest encroachment in forested areas has increased the risk of stand replacement wildfire in LOS patches. The loss of old growth patches managed as dedicated old growth would reduce connectivity, thus reducing options for terrestrial species associated with LOS to successfully move across the landscape. The loss of patches would be long-term with little opportunity for replacement within a timeline that would be favorable to associated terrestrial species.

Based on historic and current estimates for old growth habitats, total acres and continuity of LOS forested stands are currently less than what occurred historically. Acres and patch size of interior LOS have declined as well. Current average LOS interior patch size is minimal, whereas historically patch size probably averaged in the hundreds or thousands of acres.

Available and suitable LOS forest and dead wood habitat has decreased since 1945 primarily as a result of timber harvest activities. Insect and disease outbreaks, blowdown events, firewood cutting, hazard tree removal, road construction, and fire suppression have also contributed to the loss of habitat. These disturbance agents have removed snags, down wood and large diameter live trees, reduced patch sizes and connectivity, and diminished the amount of high quality LOS interior habitat and overstory canopy cover. Increased gaps and fragmentation have in turn increased the amount of lower quality LOS ecotone habitat. Insects, disease and wildfires generally increase the amount of dead wood habitat over areas that have burned, but follow up salvage logging can remove most of the large dead wood from the area.

True ponderosa pine communities have experienced the greatest reduction in dead wood and LOS forest habitat. Past management practices of overstory and partial removals of pine, as well as fire suppression, have converted forest stands previously dominated by open large diameter pine to stands with dense understories of ponderosa pine regeneration or stands now characterized as mixed conifer with dense white fir understories. Large areas of LOS pine were removed by regeneration harvest treatments. As a result, habitat suitability has declined for species associated with open, large diameter pine stands such as white-headed woodpeckers and northern goshawk. Overall abundance and distribution of these species have most likely declined from historic levels.

Succession of forest cover above 5,500 feet and on fir sites at lower elevations toward a mixed conifer composition appears to be providing more habitat for pileated woodpecker, marten and other associated species as these forest stands develop LOS structural conditions. Succession of early/mid-seral pine to late seral pine has created additional habitat for LOS associated species such as black-backed woodpecker. However, timber harvest activities have reduced forest cover in higher elevation mixed conifer habitats, resulting in highly fragmented patchy areas of forest cover in areas where large, relatively unbroken tracts existed historically.

The loss and fragmentation of available dead wood and LOS forest habitat since 1945 has reduced habitat availability and suitability. Smaller, scattered LOS patches amid large areas of forest habitat where large overstory trees are uncommon or early/mid-seral forest habitat dominates may no longer meet the habitat needs of some LOS associated species. Such a condition applies to marten and pileated woodpecker, which require large areas of contiguous LOS to meet home range habitat requirements. Isolation and crowding of individuals and pairs into these scattered patches threatens the stability of some species. Sink populations in marginal habitat patches cannot maintain themselves without continuous recruitment from source populations in preferred habitat conditions. Even the currently improved stands for species associated with LOS mixed conifer, such as the marten, pileated and black-backed woodpeckers, are offset by the fragmented nature of LOS patches and loss of interior habitat conditions.

Habitat security has gradually declined since 1945 as disturbances associated with a greatly increased road density and extensive timber harvest activities escalated through at least 1990. Future road closures/ obliterations and lower levels of timber harvest activities should reduce disturbances to LOS forest habitat and associated species.

Prescribed underburns and thinning could help restore more open park-like stands of LOS pine habitat for associated wildlife species. Without treatment, existing stands of LOS forest and dead wood habitat are at risk to potential insect and disease outbreaks and catastrophic wildfire. The risk to higher, wetter and cooler true mixed conifer sites would be lower than the risk to lower elevation true pine and warm site mixed conifer stands. The risk for the occurrence of these events has increased in the last 50 years.

Under an assumed forest management scenario on private lands similar to present management, LOS forest and dead wood habitat that has been or is eliminated and replaced by early/mid-seral forest will not return to the landscape. Forest habitat that matures on private lands in the future likely will be harvested before it develops LOS forest characteristics. As such, it will remain marginal sink habitat for species associated with LOS forest and dead wood habitats. On National Forest lands, LOS forest and dead wood habitat should gradually increase in abundance, continuity, distribution and quality over the long term if forest management objectives that focus on development and maintenance of LOS continue and as tree plantations grow into mature forests. Edge contrast between existing LOS forest and early/mid-seral forest will slowly diminish as tree plantations mature over time and are managed more for forest structural diversity (USFS, 2000).

It is unlikely that the watersheds will ever again provide LOS forest habitat within the range of historic variability. The intermingled ownership pattern will continue to contribute to the gaps and fragmentation of existing LOS forest habitat. It is also highly unlikely that open, park-like, single story ponderosa pine forest habitat will ever be as abundant and contiguous as it was prior to 1945. However, the acres of LOS mixed conifer forest are expected to increase over time. Overall, the future abundance and distribution of wildlife species associated with LOS forest habitat, especially ponderosa pine, will be less than occurred historically (USFS, 2000).

Northern Goshawk - Goshawk habitat quantity and quality has declined where open, park-like LOS pine stands have been replaced by dense, multi-story LOS stands. Increases in mixed conifer LOS appear to have influenced goshawk territory locations. The territories within the watershed are located partially or totally within mixed conifer habitats. This may reflect a loss of suitable habitat in ponderosa pine habitats rather than a preference for mixed conifer. Goshawks appear to be utilizing the dense overstory, high canopy coverage, LOS mixed conifer stands for nesting activities. Insect infestations in mixed conifer and resultant salvage activities as well as some timber harvest activities are rapidly reducing the availability of this habitat for nesting goshawks. Habitat security has declined since the 1940's in association with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use.

Foraging habitat quantity and quality has declined where open, park-like LOS pine stands have been replaced by dense, multi-story LOS stands. Habitat for goshawk prey species and foraging has improved where the removal of late and old seral (LOS) forest has increased the area of open, early seral forest cover types in small (< 4 acres) patches and edge habitat around larger openings. Habitat quality has declined since the 1940's with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use. Potential forest regeneration treatments on private lands and smaller openings created by future uneven-aged treatments on National Forest lands could continue to create edge habitat for goshawk prey species and more suitable prey and hunting habitat for goshawks. Road closures and obliterations would help reduce habitat fragmentation (USFS, 2000).

American Marten - Habitat availability and continuity have declined during the last 50 years. Habitat suitability however, may have increased in patches of LOS forest habitat where open, park-like LOS pine stands have been replaced by dense, multi-story LOS stands, and where mixed conifer has replaced or invaded pine stands. Such changes provide the dense conditions, increased overstory mortality and down wood that characterize suitable marten habitat. Sanitation and salvage logging, however, have limited the availability and abundance of this habitat. Additionally, the improved stand conditions that presently exist in LOS mixed conifer are offset by the fragmented nature of LOS patches and loss of interior habitat conditions. Habitat security has declined since the 1940's in association with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use (USFS, 2000).

As plantations grow into the mid-seral condition class, habitat conditions for marten prey species will decline. Lower marten populations could result in higher rodent populations, which will damage or kill tree seedlings. Smaller openings created by future uneven-aged treatments could create more suitable prey and hunting habitat for marten.

Pileated Woodpecker - Habitat availability and continuity have declined during the last 50 years. However, habitat suitability may have increased in patches of LOS forest habitat where open, park-like LOS pine stands have been replaced by dense, multi-story LOS stands or mixed conifer has replaced or invaded pine stands. Such changes provide the dense conditions, increased overstory mortality and down wood that characterize suitable pileated woodpecker habitat. The improved stand conditions that presently exist in LOS mixed conifer are offset by the fragmented nature of LOS patches and loss of interior habitat conditions. Sanitation and salvage harvest prescriptions continue to reduce dead wood habitats, reducing the suitability of these habitats for pileated woodpeckers. Habitat security has declined since the 1940's in association with increased disturbance from higher road densities, increased commercial logging activity, and greater recreational use (USFS, 2000).

Black-backed/White-headed Woodpecker - Habitat availability and suitability have declined in ponderosa pine and mixed conifer habitats. This decline can be attributed to the loss of LOS pine forest and to forest succession in remaining LOS forest from ponderosa pine to a more mixed conifer forest. Black-backs prefer true pine types and large contiguous stands rather than fragmented patches of LOS forest cover interspersed with early to mid seral disturbance patches. Maximum and mean patch size and interior habitat in LOS ponderosa pine and mixed conifer habitat have declined since 1945. Overstory mortality occurring in large diameter pine and fir in recent years from drought, overstocked stands, and an increase in disease and insect activity in all stand types have created additional snag habitat. This has improved nesting habitat conditions and foraging opportunity. Sanitation and salvage logging, however, have limited the availability and abundance of this habitat (USFS, 2000).

Terrestrial Species Associated with Sagebrush Steppe Habitat

The Gerber and Willow Valley watersheds contain many thousands of acres of sagebrush steppe habitat. A large percentage of this habitat type in dominated by low sagebrush, where as a small percentage is dominated by big sagebrush. Other components include antelope bitterbrush, mountain mahogany, grasses and an increasing amount of western juniper. Some terrestrial species of wildlife in the analysis area are considered sagebrush obligates, and others utilize these habitats during certain parts of the year.

Historically, the Gerber and Willow Valley watersheds likely had substantially more acres considered sagebrush steppe habitat. The ratio of low sagebrush to big sagebrush dominated habitats was probably close to current conditions as past habitat alterations to both types have been similar. Big sage stringers containing deeper soil characteristics have been heavily infiltrated by western juniper since fire suppression. Low sage plateaus typically having shallower soil and more rock have also been encroached into, but large juniper-free areas still exist.

Sagebrush habitat within the analysis area probably contained some western juniper and/or ponderosa pine clumps or stringers prior to European settlement. However, the natural fire regime likely excluded extensive juniper or pine encroachment. Native forbs and grasses were more diverse and abundant as a component of healthy sage habitat prior to the intensive grazing that came with settlement. These large expanses of sagebrush steppe habitat probably gave way to healthy and stable populations of sage obligate species other than the two discussed below.

Western Sage Grouse - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Sage grouse habitat was maintained by wildfire prior to Euro-American settlement. The quality and quantity of sagebrush habitat has declined with advanced plant succession and juniper/conifer encroachment. In many parts of the watersheds, juniper is replacing shrub habitat. Fire suppression and some historical livestock grazing have been the primary factors contributing to reduced habitat. The change in plant composition and structure has not benefited sage grouse productivity. The loss of the grass/forb component has reduced potential nesting and escape cover and eliminated or drastically reduced the forb component critical for rearing broods. These two factors in combination with weather have probably contributed to the general decline of the species throughout its historical range (USFS, 2000). The existing trend is a continued reduction of and possible extinction of local populations.

Pygmy Rabbit - (Federal Species of Concern; Bureau Assessment Species in Oregon) - Without historic or current pygmy rabbit information, population trends are difficult to determine. It is likely that pygmy rabbits historically existed in suitable pockets of habitat. Most of these big sagebrush pockets and stringers have been negatively impacted by a variety of actions. Continuing treatments of sagebrush habitat will improve the quality and quantity of suitable foraging and burrowing areas. It is unknown whether or not pygmy populations will respond to these habitat changes.

Terrestrial Species Associated with Aspen/Riparian Habitat

Aspen is gradually being replaced by junipers/conifers, primarily as a result of plant succession and fire suppression. Several factors have contributed to a decrease in aspen regeneration, including: the decadent condition of mature aspen, the change in forest structure to dense conifer stands, encroachment of juniper/conifers into meadow areas, rangelands and riparian stringers, and the buildup of debris on the forest floor. The regeneration that does occur is often set back by livestock grazing and big game browsing pressure. Where stream channels have been downcut and/or widened and the water table lowered, the site potential for aspen may have been significantly reduced or lost. There has been a loss of riparian deciduous vegetation (willows, aspen and shrubs) and lowering of water tables in riparian zones as a direct result of overgrazing in the early 1900s.

Red-naped/Red-breasted Sapsucker - Habitat quantity, continuity and suitability has declined since the turn of the century primarily due to grazing, increases in browsing ungulate populations, fire suppression and lowered water tables. This loss of preferred habitat for sapsuckers, several neotropical migrant landbird species, beaver and other deciduous riparian vegetation dependent species is a contributing factor limiting population numbers and distribution of these species across the landscape. Both population levels and distribution of aspen and deciduous riparian associated species has declined in the watersheds. To help maintain population levels, management actions that minimize the effects of grazing, along with the reintroduction of fire and management of encroaching conifers must be implemented in order to halt the gradual loss of aspen and restore its presence to areas where it historically occurred (USFS, 2000).

Beaver - Livestock grazing, fire suppression, trapping and plant succession have contributed to a decline in beaver habitat and numbers that probably began around the turn of the century. Fire suppression and plant succession have reduced the availability and abundance of some important deciduous forage species. Shade intolerant and fire-associated species, such as aspen and willow, have most likely declined in density and distribution as decadent stands are replaced by juniper/conifers.

Historic as well as more recent livestock grazing has reduced the availability and abundance of summer herbaceous and winter deciduous forage species, and altered channel conditions and flow regimes. In some stream systems, these changes have occurred to the extent that beaver habitat requirements for water and food may no longer be provided. Upland timber harvest and road construction have contributed to altered runoff and stream flow regimes to the detriment of beaver habitat.

Trapping harvest and transplant records indicate that direct removal of beavers has also affected populations and most likely distribution as well. It appears that trapping pressure was heavy from settlement time through around 1920, and again from 1950 to 1970. The trapping closure initiated in 1988 and in effect until 1998 has probably protected beaver populations to some extent. However, on-going damage trapping and removal of beaver colonies near culverts has negatively affected beaver populations during this period (USFS, 2000).

As beaver are lost from the system, wetland habitat is reduced, as is associated plant and animal diversity and productivity. In addition, water and sediment storage and transport are altered, and nutrient cycling and decomposition dynamics are changed.

Recent riparian recovery, in areas where the loss of willow and other deciduous riparian species was limiting population growth, has benefited beaver populations. Recovery in local areas has allowed beaver to occupy new sites and be more productive in areas where they have existed throughout history.

Other Terrestrial Species

In general, the quality and quantity of habitat in forest and shrub communities has increased for wildlife species favoring advanced succession and multi-canopy layers, while decreasing for species favoring open, park-like forested stands or diverse age structure with grass and forb understory in shrub communities

Shrub dependent terrestrial species have declined in distribution and numbers due to livestock grazing, fire suppression, and plant succession. The natural mosaic of shrublands in a variety of seral stages historically maintained by wildfire has been converted to juniper-dominated sites with very little shrub/herbaceous understory. Grazing also has removed much of the fine herbaceous understory needed to carry a fire. Current livestock grazing management should allow some recovery of upland shrub habitats. Full recovery may require the introduction of fire.

Riparian-dependent species have also experienced declines in distribution and abundance. This is attributable to lowered water tables, fire suppression, juniper/conifer competition and the loss of riparian woody vegetation associated with livestock grazing. These species should benefit under current livestock management, however, where late season use allows cattle access to riparian areas and deciduous riparian vegetation, recovery will be impeded (USFS, 2000).

Herptiles- Historic native reptile and amphibian populations were probably more stable and robust. Habitat degradation, exotic species introductions and harvest are some of the factors that have effected herptile populations since Euro-American settlement. Healthy riparian zones adjacent to aquatic systems without predatory fish and bullfrogs probably contained a higher diversity and larger populations of herptiles.

As riparian areas and shrub-steppe habitats recover, reptile and amphibian populations should respond. However, with stable and robust populations of exotic predators, certain aquatic areas will remain unsuitable for most native, less competitive herptiles.

Osprey - Osprey foraging habitat has likely increased while nesting and roosting habitat has decreased. Populations in the watershed have likely increased since pre-settlement times. Additional osprey nesting is possible as conifers near reservoirs increase in size and stressed, mature trees turn into snags. Ospreys will benefit if fish populations remain stable in reservoirs with adjacent suitable nesting habitat. .

Landbirds – Since the golden-crowned kinglet, pine siskin and pygmy nuthatch favor larger ponderosa pine and ponderosa pine snags, they were likely more abundant prior to settlement versus current conditions. The olive-sided flycatcher, which favors mixed conifer edge and burned area, were likely more abundant. Continuation of current management strategies for LOS and snag retention may be beneficial to these land bird species.

Species associated with native perennial grasses like Vesper sparrow, lark sparrow, horned lark and western meadowlark were probably more abundant prior to fire suppression and excessive livestock grazing.

Meadows have declined due to impoundment and encroachment. Continued encroachment of juniper into meadows will cause declines of meadow dependent species.

Big sagebrush communities are of concern because their extent and health have been affected by a variety of factors including fire suppression, grazing, noxious weeds (cheat grass) and climate change. These vegetation communities provide the structural complexity needed to support a greater variety of bird species than the low sage community occurring in the scab-rock flats; however, both communities are important for their own suite of bird species. Historic shrub communities dominated by mountain mahogany and bitterbrush likely supported species including the green-tailed towhee. Sagebrush obligate songbird species including Brewer's sparrow and sage thrasher were likely widespread in healthy sage habitats. Continued changes in habitat from shrub/grassland to juniper will reduce wildlife species that depend upon shrub and grassland habitats.

Lark sparrows tend to be associated with habitats where there is an interspersion of shrubs and juniper. Gray flycatchers are associated with shrubs and mature juniper. It is possible that these two species are as successful today as they were under historic conditions.

Riparian dependent bird species like willow flycatcher, orange-crowned warbler, calliope hummingbird, yellow warbler, MacGillivray's warbler, Wilson's warbler, black-headed grosbeak, song sparrow and Lincoln's sparrow probably suffered with the decline of properly functioning riparian habitat. Recent riparian recovery has benefited landbird populations in areas where the loss of willow and other deciduous riparian vegetation was limiting landbird use.

IV. Human Uses

Timber

Early management of forest lands on all ownerships began in the 1870's, when livestock operators ran large numbers of sheep, cattle, and horses on the forest and woodland ranges. This removed available forage, and, in the process, also removed ground fuels that would have "carried" periodic light ground fires under natural conditions. Coupled with fire suppression after about 1900, these actions reduced natural fires and allowed juniper and pine seedlings to become established on sites where, under natural conditions, they would not have survived natural burns. In addition, naturally open juniper and pine stands also experienced an increase in juniper and pine seedlings, resulting in the dense stands of today. Creation of National Forests and implementation of the Taylor Grazing Act of 1934 later introduced grazing regulation on these public lands.

Timber harvest began with settlement and provided building materials for local homes, ranch buildings, and fences. Large scale harvest operations on private lands started after 1930 on Weyerhaeuser lands, and continues today under U.S. Timberlands ownership. On Fremont National Forest lands, harvests increased after World War II, and concentrated on removal of large, old-growth pine. Since the early 1990's, harvest levels have been drastically reduced, and objectives have shifted to restoration treatments to protect existing old-growth trees and development of old-growth forest structures. On BLM lands, harvest of green timber began after 1947, with sanitation-salvage as the main objective. Harvest levels remained generally steady until the mid 1990's, and have declined since. Maintenance of an overall multi-aged stand structure, (especially the large tree component) and reduction of stand densities by commercial thinning have been BLM management objectives for the last 30-40 years. Since 1980, underburning has been extensively applied to National Forest and BLM lands in the watershed.

Grazing

BLM Administered Lands - (The Gerber Block)

This section contains specific narratives, which will provide for the synthesis and interpretation of the previously outlined information for each of the 18 grazing allotments in the analysis area. When available, existing rangeland monitoring information (and/or other pertinent data) will be summarized in this section as it is some of the most important information necessary to ascertain whether pertinent grazing related objectives (KFRA ROD/RMP, Standards for Rangeland Health, etc.) are being met or not.

Much of the BLM administered lands in the analysis area has recently (1999-2002) been assessed/evaluated via *Rangeland Health Standards Assessments*. This includes the following allotments: Bear Valley, Horsefly, Dry Prairie, Pitchlog, Timber Hill, Horton, Campbell, and Willow Valley. These allotments, which make up about 2/3rds of the BLM acreage in the analysis area, will have the monitoring analysis and conclusions briefly summarized and referenced - but not reiterated - in this document. Some information or data collected since the Assessments were completed may be briefly described and analyzed as necessary. Management recommendations from the completed Assessments will be brought forward into *Step 6 – Management Recommendations* in this watershed analysis.

The allotments that are to be formally assessed via this analysis will have the available monitoring, and other pertinent information/data, more comprehensively addressed. These allotments are: "J" Spring, Paddock, Bumpheads, DeVaul, Goodlow, Pankey Basin, Horse Camp Rim, and Rock Creek. A few of these allotments have ample amounts of information, though most have very little; all have ecological site inventory (ESI) data. The ESI information was extensively summarized in Steps 3 & 4 and broadly analyzed in the "Vegetation – Non-Forested Uplands" portion of this Step. The analysis of ESI information in this grazing section, will tie into and be consistent with this latter analysis, but be focused on the allotment/pasture level.

In addition, 7 of the allotments without significant monitoring information ("J" Spring, Paddock, DeVaul, Goodlow, Horton, Campbell, and Pankey Basin) had a "Rangeland Health Evaluation Summary Worksheet" done on each of them during October 2000. This process - which is also referred informally to as an Upland PFC (Proper Functioning Condition) Assessment – entails a field visit and qualitative evaluation by a team of appropriate resource specialists. More specifically, after a general field check, a representative area (or areas, if necessary) is selected to evaluate via 17 different resource "attributes", e.g. Water Flow Patterns, Compaction Layer, Annual Production, etc. Each of the attribute categories is ranked according to departure from some selected baseline, which in the case of our rankings is the Ecological Site Description (ESD). The amount of departure from the ESD can range from either "none" (same as ESD) to "extreme" (high deviance from the ESD).

Once completed, the ratings within the 17 attribute categories are tallied to rank the area's functionality into three broad "Rangeland Health Attributes" as follows (with brief explanation):

<u>Soil Site Stability</u>: The capacity of the site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water.
<u>Biotic Integrity</u>: The capacity of the site to support characteristic functional and structural communities in the context of normal variability, to resist loss of this function and structure due to disturbance, and to recover following disturbance.
<u>Hydrologic Function</u>: The capacity of the site to capture, store, and safely release water from rainfall, run-on, and safely release water from rainfall, run-on, and snowmelt (where relevant), to resist a reduction in this capacity, and to recover this capacity following degradation.

These final ratings can determine that conditions are functional or indicate that rangeland health/functionality problems may exist and point out the need for future studies that would confirm the rating and possibly isolate the cause(s). These evaluations are not to be used as "stand-alone" tools to determine the final "health" of an area. As per guidance, "…*changes in management are not appropriate based solely on (these) evaluations of range health*…". However, a preponderance of "moderate" to "extreme" ratings during this evaluation should stimulate other actions (e.g. review or initiation of inventory or monitoring, evaluation of current management, etc.) that would determine the cause of the unsatisfactory rating and eventually lead to appropriate management changes to "fix" the resource problem. The Upland PFC process is explained in TR 1734-6, *Interpreting Indicators of Rangeland Health* (USDI BLM 2000).

As part of the Assessment process, the grazing use on these allotments is compared to each of the 5 Standards for Rangeland Health – all of which are generally related to the "sustainability" Key Question in Step 2. This comparison is made to ascertain whether the Standard is being met; not met, but grazing management is making significant progress towards meeting; not met and livestock are not the primary cause; or not met and current livestock grazing management is the primary factor for not meeting the Standard(s). If the latter determination is made for an allotment or pasture, this section will identify what specific grazing related problem(s) exist. This section will lead into Step 6, where as necessary, recommendations will made to move grazing management towards meeting the 5 Standards and Land Use Plan (LUP) resource objectives.

The 5 Standards for Rangeland Health – with brief interpretive statements from the Oregon/Washington guidance (USDI BLM 1997) - are as follows:

<u>STANDARD 1 - WATERSHED FUNCTION - UPLANDS</u> (Upland soils exhibit infiltration and permeability rates, moisture storage and stability that are appropriate to soil, climate and land form.)

<u>STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS</u> (Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and land form.)

<u>STANDARD 3 - ECOLOGICAL PROCESSES</u> (Healthy, productive and diverse plant and animal populations and communities appropriate to soil, climate and land form are supported by ecological processes of nutrient cycling, energy flow and the hydrologic cycle.)

<u>STANDARD 4 - WATER QUALITY</u> (Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.)

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES</u> (Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and land form.)

Existing grazing use will also be compared to the Oregon/Washington *Guidelines for Livestock Grazing Management* to ascertain if the current management practices, actions, and/or techniques are appropriate (guidelines were explained in Step 3). Assessment of all grazing allotments by 2008 is required by current BLM policy. The general direction, processes, and scheduling for the Klamath Falls Resource Area is outlined in the *Plan for the Implementation of Standards and Guidelines* dated 10/29/98, a copy of which is available on the KFRA's website http://www.or.blm.gov/Lakeview/kfra/whatwedo/Range/Rangeland_Health/KFRA_SG_Plan.pdf

The following are the allotment specific narratives that will address the Key Question(s), 5 Standards, and/or LUP objectives as appropriate. Please note that due to the different amounts of allotment information available, past Assessment completion or need to do the Assessment in this document, allotment priorities, and other factors, each of the following allotment narratives vary substantially in size, scope, and detail. (The actual monitoring, survey, and other information/data summarized in the following section, is located in the KFRA office.)

One final note is useful here, as it is pertinent to all of the allotments within the analysis area. The ESI information shows that that there have been significant, site atypical, increases in juniper density on virtually all of the juniper potential ecological sites in the watershed analysis area. In general, the more shallow the soil, the slower the juniper encroachment and/or density increases. Specifically, the deeper soil areas dominated by pine or big sagebrush have experienced the most pronounced juniper increases; the shallower Claypan sites have experienced moderate to low increases; and the shallowest, scabby sites have the least increase. Since this fact is common throughout the analysis area and has been extensively discussed elsewhere in this document, it will not be additionally addressed. (See the Step 5 section on Upland Vegetation for more information.)

"J" Spring Allotment (0803)

This small allotment is located just to the northeast of Gerber Reservoir. It is a low priority, late spring grazing use allotment, which historically was grazed in common with a similar sized parcel of private lands - where the actual "J" Spring is located. However, in 1999, the private lands were fenced separately leaving the BLM as a discrete pasture. This allows for controlled grazing use and enhanced management of the BLM lands. Due to the allotment's low priority and apparent lack of historical resource problems, none of the typical rangeland monitoring studies have been established. However, some other useful resource information has been collected in recent years - an explanation of which follows:

Ecological Site Inventory: During the 1997 field season, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Total "J" Spring Allotment Acres by Ecological Site & Condition Class*

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Mahogany-Fescue	28.89	0	0	0
Juniper Claypan 16-20"	0	53.64	0	0
Stony Claypan 14-20"	231.32	0	0	0
Totals	260.21	53.64	0	0

*Acres breakdown: public - 99.8%, private - 0.2%

Condition Classes	% of total classified
Potential Natural Community	82.9%
Late Seral	17.1%
Mid Seral	0%
Early Seral	0%

As the above information shows, the entire allotment was classified as either late seral or PNC. The PNC is by definition a fully functional and appropriate plant community. The 17% of the allotment that was classified as late seral Juniper Claypan 16-20" is also thought to be functioning properly, since it was found to have a high percentage of native perennial grasses (49%) and site typical forbs (12%) and shrubs (33%). The area was mildly downgraded to the upper end of the late seral condition class because of a moderate overabundance of low sagebrush (30% versus a site typical 20%), slight under abundance of native perennial grasses (49% versus a site typical 65%), and some young juniper encroachment in an otherwise very healthy PNC old-growth juniper area. The ESI estimates of apparent trend on this allotment were static to slightly upwards; appropriate trends given the existing elevated ecological conditions. The ESI estimated Soil Surface Factor (SSF) ratings averaged "Slight" implying very limited current soil erosion activity.

Other Upland Monitoring/Information: A Rangeland Health Evaluation was performed and Summary Worksheet prepared on this allotment October 3, 2000. The evaluation worksheet was done in the center of the dominant ecological site on this allotment – the Stony Claypan 14-20". That evaluation rated the areas average functionality at "slight" departure from site potential, and in fact, noted that this area could function well as a reference area (i.e. a good vegetation condition, ecologically functional area that other similar evaluation sites could be compared to). This rating strongly indicates at least adequate rangeland health and functionality and little, if any, risk of future degradation.

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: Standard Met. There are no riparian/wetland areas on this allotment. Grazing management is currently appropriate and not contributing to offsite riparian/wetland problems.

STANDARD 3 - ECOLOGICAL PROCESSES: Standard Met. The high seral state vegetation communities found on this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: Standard Met. There are no 303(d) listed waters within this allotment. Though there is no perennial water on this allotment (livestock water is on neighboring private lands), current grazing management is thought to be appropriate and not contributing to offsite water quality problems.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*. There are no allotment specific LUP objectives for "J" Spring, and thus no specific analysis pertinent to the LUP is necessary.

Paddock Allotment (0844)

This allotment is located in the north central portion of the Gerber Block, directly south of the Fremont NF boundary. This allotment like "J" Spring is a low priority, late spring grazing use area. For many years it was grazed in common with a portion of the Gerber Ranch private meadowlands, though as noted in Step 3, the allotment was fenced separately from the private lands in 1996. This has allowed for enhanced management of the BLM lands by controlling grazing use. The season long - and often heavy - grazing use that was common prior to the fence construction has not occurred and upland vegetation conditions have already distinctly improved with noticeably more numerous and vigorous native perennial grasses.

The new fencing also controls/limits the grazing on a very small (4-5 acre) BLM meadow area in the extreme southeast corner of the Paddock allotment. This is a very small corner of the bigger, privately owned, Gerber Ranch meadow and was grazed in common with the private up until the 1996 fencing. It contains a small portion of the privately controlled "ditch" that allows for the flood irrigation of the entire (public and private) meadow with Barnes Creek water that is diverted on the private lands further upstream. This ditch may have created - and undoubtedly helps to maintain - the wet meadow nature of the BLM meadow area.

Ecological Site Inventory: During the 1997 field season, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Total Paddock Allotment Acres by Ecological Site & Condition Class

Ecological Site	**PNC**	**Late Seral**	**Mid Seral**	**Early Seral**
Pine-Sedge-Fescue	0	148.81	17.94	0
Stony Claypan 14-20"	50.69	0	0	0
Shallow Stony 10-20"	195.79	0	0	0
Ephemeral Lakebed	0	4.07	0	0
Totals*	246.48	152.88	17.94	0

*Acres breakdown is: public 99.6%, private 0.4%

Condition Classes	**% of total classified**
Potential Natural Community	59.1%
Late Seral	36.6%
Mid Seral	4.3%
Early Seral	0%

The ESI information above shows that the vast majority of this allotment classified as late seral or PNC. All of the Stony Claypan and Shallow Stony ecological sites were PNC and by definition a fully functional and appropriate plant community. The ESI estimates of apparent trend were static to slightly upwards; appropriate trends given the existing elevated ecological conditions. The ESI estimated Soil Surface Factor (SSF) ratings were all in the low end of “Slight”, implying very limited current soil erosion activity. Now that grazing use levels are better controlled, these good to excellent conditions should maintain or slowly improve, though improvement for a PNC site is not always possible.

Most of the Pine-Sedge-Fescue in this allotment was found to be in late seral condition with an upward apparent trend. These pine areas had been logged in years past and more recently, under burned. The shrub understory is still in the process of restoring – the reason for these sites being in less than PNC and for the perceived upward trends. There was a small (approx. 18 acres) strip of mid seral condition Pine-Sedge-Fescue in the northeast corner of the allotment. This area appeared to be a long-term, cattle-shading area with little existing native understory, due to this pine stand’s proximity to the private meadowlands. It has also been under burned in recent years causing or aggravating a cheatgrass problem. Though this is not a significant resource issue, this small areas condition will probably improve over time due to the currently enhanced cattle control.

Other Upland Monitoring/Information: A Rangeland Health Evaluation was performed and Summary Worksheet prepared on this allotment October 10th, 2000. The evaluation worksheet was done in an open portion of the allotment that over time has typically received at least allotment average grazing pressure and is thought to be representative of this allotment. The write-up area was a complex of several low sagebrush dominated ecological sites (Stony Claypan 14-20", Claypan 14-20", and Claypan Bottom 12-18"). The evaluation rated the areas overall functionality at “slight” departure from site potential. This rating strongly indicates at least adequate rangeland health and functionality, and little if any risk of future degradation.

The small BLM portion of meadow referred to above was heavily grazed for decades and the ecological conditions were (and probably continue to be) suppressed. An ESI rating done on the area in 1999, estimated the condition to be in the lower end of the late seral condition class, though the area is difficult to classify as to precise ecological site. The 1996 fencing effectively curtailed the excessive cattle use and is allowing for a slow restoration and maintenance of a more functional meadow community. The ESI rating estimated the apparent trend as "upwards" and the erosion class as "slight" – both positive qualitative indicators of appropriate current management. However, when grazing use is made in this allotment the cattle still tend to congregate in the meadow corner. If this use becomes unacceptable in the future, options could be explored (see Step 6).

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. The one very small area of mid seral (Pine-Sedge-Fescue ecological site) is probably adequately functional, not significant enough to affect the allotment's overall functionality, and the existing grazing management is allowing for slow upward trends. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: Standard Met, or if not fully met, significant progress towards meeting is being made. The small meadow area has upwards trends and grazing management is thought appropriate for achieving wetland functionality, if not already adequately functional.

STANDARD 3 - ECOLOGICAL PROCESSES: Standard Met. The high seral state vegetation communities found on this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: Standard Met. There are no 303(d) listed waters within this allotment. Excluding the privately controlled ditch, there is no perennial water on this allotment (livestock water is on neighboring private lands or from the ditch). Current grazing management is thought to be appropriate and not contributing to offsite water quality problems.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

Current grazing use is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*. There are no allotment specific LUP objectives for Paddock, and no specific LUP analysis is necessary.

Yainax Allotment (0861)

This allotment is located on the extreme north end of the analysis area - on and around Yainax Butte and the adjacent Klamath Forest Estates area - and is totally outside of the BLM's contiguous Gerber Block. As noted in Step 3, Yainax is a very minor component of the Yainax Butte Coordinated Resource Management Plan (CRMP) area, which is comprised mostly of Fremont National Forest and private lands. In addition, at least half of this fragmented allotment is outside the watershed boundaries, with only the BLM lands on the south side of Yainax Butte inside the watershed analysis area.

Since the Yainax allotment is outside of the Gerber Block, there was no ESI information collected at that time. However, in late 2002, the ESI was completed for all of the BLM lands. This information has not be compiled, but did find that a large majority of the area was in either late seral or PNC and in appropriate condition. Some limited rangeland monitoring information has been collected on this allotment over the past

7-8 years, including a couple years of utilization mapping and/or use points and the establishment of some upland trend photo plots in 1999. Given the fact that the *Rangeland Health Standards Assessment* for this allotment is scheduled for completion in 2003 or 2004 and not as part of this analysis, no grazing specific analysis of this allotment will be made. This watershed analysis will however, be a major reference when preparing that Assessment.

Bear Valley Allotment (0876)

This mid-summer grazing use allotment is located in the southeastern portion of the Gerber Block. As noted in Step 3, it is a moderately high priority, 3-pasture deferred rotation allotment with a high percentage of unfenced private lands intermingled with the BLM. The allotment's *Rangeland Health Standards Assessment* was completed in 2000 and found that the overall current grazing use was within the sustained yield capacity of the allotment, with the included private lands, and appropriate for maintaining the current overall good vegetation conditions. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized in the following narrative as necessary. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health, which is found at the end of this section.

Ecological Site Inventory: Though no new rangeland monitoring information has been collected for Bear Valley since the recent completion of the Assessment, the 1997-1998 ESI information has been refined so that a very accurate figure is available - by pasture - for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres by pasture has also been calculated to a reasonably accurate level. That information is summarized as follows:

North Pasture - Bear Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	1444.62	252.92	0
Pine-Mahogany-Fescue	0	636.60	0	0
Juniper Claypan 16-20"	365.83	57.63	0	0
Stony Claypan 14-20"	65.24	355.82	0	0
Shallow Stony 10-20"	0	912.89	0	0
Claypan 14-20"	91.43	0	0	0
Ephemeral Lakebed	2.24	0	252.92	0
Totals*	524.74	3407.56	252.56	0

*Classified acres breakdown: public - 42%, private - 58 % (Pasture also contains 152.01 acres of unclassified private lands not included in the totals. Total pasture size is 4337 acres.)

Condition Classes	% of total classified
Potential Natural Community	12.5%
Late Seral	81.4%
Mid Seral	6.1%
Early Seral	0%

Bear Flat Pasture - Bear Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	56.86	0	0
Pine-Mahogany-Fescue	0	46.24	0	0
Juniper Claypan 16-20"	0	67.04	0	0
Shallow Stony 10-20"	0	18.55	0	0
Ephemeral Lakebed	564.98	0	0	0
Totals*	564.98	188.69	0	0

*Classified acres breakdown: public – 23%, private – 77 %. Pasture contains 134.19 acres of unclassified private lands not included in the totals. Total pasture size is 888 acres.

Condition Classes	% of total classified
Potential Natural Community	75%
Late Seral	25%
Mid Seral	0%
Early Seral	0%

South Pasture - Bear Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	833.84	607.25	0
Pine-Mahogany-Fescue	0	971.20	0	0
Juniper Claypan 16-20"	876.91	152.54	0	0
Stony Claypan 14-20"	54.53	0	0	0
Shallow Stony 10-20"	214.38	100.14	0	0
Juniper Dry Pine14-16"	0	587.99	0	0
Claypan 14-20"	20.10	0	0	0
Claypan Bottom 12-18"	0	26.83	0	0
Dry Meadow	67.14	58.91	0	0
Semi Wet Meadow	27.94	0	0	0
Totals*	1261.0	2731.45	607.25	0

*Classified acres breakdown: public – 69.2%, private – 30.8 % Pasture also contains 186.07 acres of unclassified private lands not included in the totals. Total pasture size is 4786 acres.

Condition Classes	% of total classified
Potential Natural Community	27.4%
Late Seral	59.4%
Mid Seral	13.2%
Early Seral	0%

Total Bear Valley Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	2335.32	860.17	0
Pine-Mahogany-Fescue	0	1664.66	0	0
Juniper Dry Pine	0	587.99	0	0
Juniper Claypan 16-20"	1242.74	277.21	0	0
Stony Claypan	119.77	355.82	0	0
Claypan	111.53	0	0	0
Claypan Bottom	0	26.83	0	0
Shallow Stony	214.38	1031.58	0	0
Semi-wet Meadow	27.94	0	0	0
Ephemeral Lakebed	567.22	0	0	0
Dry Meadow	67.14	58.91	0	0
Totals*	2350.72	6338.32	860.17	0

Allotment contains 472.27 acres of unclassified private lands not included in the totals. Total allotment size is 10,011 acres. Classified acres breakdown: public - 50.8%, private - 49.2 %

Condition Classes	% of total classified
Potential Natural Community	24.6%
Late Seral	66.4%
Mid Seral	9.0%
Early Seral	0%

The ESI information above shows that the large majority (91%) of the allotment is in either late seral or PNC condition. As discussed in this Step's section on "Vegetation - Non-Forested Uplands", these seral stages are thought to be at least adequately functional in regards to the major attributes of rangeland health (i.e. soil/site stability, hydrologic function, and integrity of the biotic community) for the ecological sites that dominate this allotment. All the mid seral areas were Pine-Sedge-Fescue sites that have received extensive alterations from past timber harvest, and more significantly, from recent (1990's) burning activities. As noted previously, it takes many years for the understory shrubs to re-establish after under burning these ecological sites, resulting in suppressed ecological condition ratings for 10-20 years after burning. Even with these extensive disturbance activities, 73% of the Pine-Sedge-Fescue areas were found to exhibit late seral conditions, though recent (post-survey) burning on BLM lands and timber harvest activities on private lands in the area have probably lowered that figure.

Other Condition Studies: A key area condition study was informally established on the allotment in 1983, in the now separately fenced South Pasture. That reading determined that conditions were "good" (late seral) if compared to the recently revised Ecological Site description. The condition information was re-read in 1996 at the approximate location of the original reading. This reading found that conditions still remained good with possibly a slight increase in the condition rating. (Complete summary in the Bear Valley Assessment.)

Trend Studies: There is one long-term photo trend study in the allotment, located near the key area where the above condition study was done. The Bear Valley Assessment found that "…the photo plot shows a static to slight upwards trend in grasses and total vegetation cover…" over the 24 years since study establishment. Additionally in 1996, a nested frequency trend plot was established in the South pasture. It was reread in 2000 and, in the 4 years since establishment, Sandberg's bluegrass had significantly increased
− And finally, observations of "apparent trend" were made during the ESI in 1997-1998. Of the 40 site write-ups done on the allotment 63% showed an upward trend and 37% showed a static apparent trend – appropriate given the good existing ecological conditions dominating the allotment. (Complete summary in the Bear Valley Assessment.)

Utilization Studies: Utilization has been periodically read on the Bear Valley allotment since the mid 1980's, with use pattern mapping done since the early 1990's. Overuse was common in some areas prior to the construction of the pasture division fence in 1993 and the Holbrook exclosure fence in 1995. Since that time livestock distribution has been improved and overuse rarely occurs on public lands, though there is still some overuse that frequently occurs around the privately owned Deer Spring. In fact, utilization levels on the majority of the allotment are consistently slight to light, with some moderate in the areas with springs and meadows. All this is considered appropriate use. (Complete summary in the Bear Valley Assessment.)

Other Upland Monitoring/Information: During the ESI survey, Soil Surface Factor (SSF) ratings were made. SSF is a qualitative estimate of current soil erosion activity at a given site. Of the 40 site write-ups for the Bear Valley Allotment, 7 were rated as Stable, 29 as Slight, and 4 were rated as Moderate. In general, the majority of the allotment has little erosion due to good vegetation cover and gentle slopes.

Riparian Monitoring: Several riparian related monitoring studies have been completed on this allotment, though most of the allotments riparian/wetland areas are on privately owned lands. A complete summary of the monitoring is found in the Bear Valley Assessment and will not be repeated in this section. Also see the riparian sections of this analysis. The Assessment did come to the following summary conclusion about riparian/wetland areas in the allotment:

> *"Overall, the riparian and wetland areas on the federal lands within the allotment are in good condition. Some areas have received heavy livestock utilization in the past. The current pasture rotation system with the changes discussed under Management Recommendations (in the Assessment) and the fenced exclosures should allow most of the areas to maintain or improve their conditions."*

The analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following conclusions in regards to the 5 Standards for Rangeland Health (explanation statements summarized from Assessment analysis):

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: Standard Met. Though there have been some public land riparian/wetland problems on this allotment, grazing related management changes in recent years (fencing, rotation system) appear to be solving them, though long term monitoring will be necessary to confirm this.

STANDARD 3 - ECOLOGICAL PROCESSES: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: The meeting of this standard cannot be determined with the information available. There are no water bodies within the allotment that have been monitored for water quality standards. There are no 303(d) listed waters within this allotment. Ecological conditions are high on both upland and most riparian/wetland areas implying that those areas are not contributing to poor water quality, if there is a problem.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

As noted in Step 3, the KFRA ROD/RMP listed four specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting or appropriately moving towards the meeting of all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Bumpheads Allotment (0877)

Bumpheads is a moderately high priority, mid to late spring use allotment, located in the southwestern portion of the Gerber Block. It has two primary grazing pastures that are grazed on a deferred rotation system. (There is also one small transition pasture that abuts the private lands to the west that is used for a short time at turn-on.) As noted previously, Bumpheads has approximately one-half of its acreage in the watershed analysis area, though it must be considered as a whole for continuity of grazing analysis.

In addition to the recent ESI survey information, this allotment has had an ample amount of monitoring data collected on it over the past 25 years due to its relatively high priority in the resource area. This includes various trend and condition studies, utilization, riparian photo points, and other vegetation information. Since this analysis is the formal Rangeland Health Standards Assessment for this allotment, the monitoring information will be evaluated and summarized here to assist in determining if current grazing management is appropriate.

Ecological Site Inventory: During the 1997 and 1998 field seasons, ecological site inventory (ESI) information was collected for this allotment. This was part of a larger inventory that covered the Gerber Block of BLM-administered lands. That information is summarized as follows:

North Pasture - Bumpheads Allotment -Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	497.4	626.8	0	0
Juniper Claypan 12-16"	0	935.3	819.9	0
Shrubby Loam 16-20"	0	63.6	0	0
Stony Claypan 14-20"	84.7	152.8	0	0
Shallow Stony 10-20"	0	427.8	173.6	0
Juniper Mahogany Fescue	0	20.0	27.1	0
South Slopes 14-18"	0	0	144.8	0
Totals*	579.1	2226.3	1165.4	0

*Acres breakdown: public - 100%, private - 0 % Pasture also contains 41.3 acres of unclassified private lands. These are not included in the totals above and are a combination of primarily rock outcrop and water.

Condition Classes	% of total classified
Potential Natural Community	14.6%
Late Seral	56.1%
Mid Seral	29.3%
Early Seral	0%

South Pasture - Bumpheads Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	545.1	0	0	0
Juniper Claypan 12-16"	237.3	1388.5	663.4	474.8
Shrubby Loam 16-20"	0	83.91	0	0
Stony Claypan 14-20"	284.4	171.6	0	0
Shallow Stony 10-20"	72.9	822.6	206.0	0
Ephemeral Lakebed	0	12.04	0	0
Dry Meadow	0	10.73	0	0
Juniper Mahogany /Fescue	0	41.89	0	0
South Slopes 14-18"	0	0	213.0	0
Totals*	1139.7	2531.27	1082.4	474.8

*Acres breakdown: public – 99.2%, private – 0.8 % Pasture also contains 222.94 acres of unclassified lands – 182.61 acres of BLM and 39.97 acres of private. These are not included in the totals above and are a combination of primarily rock outcrop and water.

Condition Classes	% of total classified
Potential Natural Community	21.8%
Late Seral	48.4%
Mid Seral	20.7%
Early Seral	9.1%

Total Bumpheads Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	1042.5	626.8	0	0
Juniper Claypan 12-16"	237.3	2323.8	1483.3	474.8
Shrubby Loam 16-20"	0	147.51	0	0
Stony Claypan 14-20"	369.1	324.4	0	0
Shallow Stony 10-20"	72.9	1250.4	379.6	0
Ephemeral Lakebed	0	12.04	0	0
Dry Meadow	0	10.73	0	0
Juniper Mahogany Fescue	0	61.89	27.1	0
South Slopes 14-18"	0	0	357.8	0
Totals*	1721.8	4757.57	2247.8	474.8

*Acres breakdown: public - 99.1%, private - 0.9 % Allotment also contains 304.04 acres of unclassified lands - 223.91 acres of BLM and 80.13 acres of private. These are not included in the totals above and are a combination of primarily rock outcrop and water.

Condition Classes	% of total classified
Potential Natural Community	18.7%
Late Seral	51.7%
Mid Seral	24.4%
Early Seral	5.2%

The tables above summarize the inventory information based upon acres of the different ecological sites and their rated condition classes. From these tables, the data shows that approximately 70% of the allotment is in the Late Seral or Potential Natural Community condition classes. Approximately 25% is rated as Mid Seral and about 5% is Early Seral.

The majority of the mid and early seral areas are in the Juniper Claypan 12-16" ecological site. These lower condition areas are located in the western portions of the allotment and below the Woolen Canyon rim. They are within the boundaries of a 1937 wildfire that burned almost 12,000 acres, of which 10,000 was public land. As discussed in previous sections, it is believed these areas were heavily used by livestock (sheep, cattle, and horses) before and after this wildfire – at levels far higher than those found today. This is likely the reason that the area declined in condition and is now inhabited by weedy exotic grasses including cheatgrass and medusahead. These conditions are also reflected in the photo trend and condition monitoring sites located in this area (discussed later). The ESI site write-ups from this area also indicate moderate levels of soil erosion and below average forage production levels. In the Juniper Claypan sites in the west part of the allotment, this appears to be due to the presence of the weedy annual grass species as noted above. These species have displaced the native perennials, lowering the total production of the sites. Junipers are also present at moderate to high levels in all age classes. As the junipers increase in size and density, the amount and vigor of shrubs and grasses can be negatively affected.

<u>Other Condition Studies</u>: Key area based condition studies have been established at four different sites in this allotment - BH-2, BH-3, and BH-4 in the South pasture, and BH-5 in the North pasture. These condition studies are performed using the ESI method that estimates the current annual production for each of the plant species. This information is then compared against the applicable Ecological Site Description ("climax plant community") to arrive at a condition rating. The information from these studies is summarized as follows:

Site BH-2: An ESI based condition study was conducted at this key area in 1998, repeating a condition rating originally made in 1983. This key area is located on the west side of the South pasture, above the Woolen Canyon Rim, at the BH-2 photo trend site. This study is in a Shallow Stony 10-20" ecological site, which was used for ecological condition comparison. Compared to this site description, BH-2 rated at 32.9%, which is considered a mid-seral ecological status. Specific data from the inventory shows that about

10% of the total composition is comprised of weedy annual grasses including medusahead and annual bromes. Perennial grasses total 7% and include Sandberg's bluegrass, Thurber's needlegrass, and bottlebrush squirreltail. About 55% of the total vegetation was *Epilobium paniculatum* - a weedy annual forb.

As noted, a condition rating was also done in this area in 1983. The 1983 rating appears to have been an ocular estimate, similar to the ESI method, of the vegetation that was present. The data sheet shows a high percentage (38%) of medusahead and a low percentage of Sandberg's bluegrass (6%). An overall condition rating of 18% was recorded for this survey. Though this site has a high percentage of invasive grass and forb species, a lower current mid-seral rating (32.9%), and very low levels of perennial grasses, it appears from the two widely separated readings that conditions are improving, albeit slowly.

Site BH-3: This condition study, which is located in the extreme southwestern corner of the South pasture below the Woolen Canyon Rim, was also originally read in 1983 and re-read – as close as possible – in 1998. It is at the same location as the BH-3 photo trend site discussed later. Like the previous condition study, this one is also in a Shallow Stony 10-20" ecological site. Compared to the site description, BH-3 rated at 24.2%, which is the upper end of the early seral ecological category. Data from the inventory shows a high percentage of weedy species present in the area, with annual bromes and medusahead making up a combined 25% of the composition and willow herb making up 46%. The primary perennial grasses - Sandberg's bluegrass and bottlebrush squirreltail - comprise only 1.5 and 1.4%, respectively, of the total composition.

In 1983, the original condition reading was completed near this site. This resulted in a condition rating of 20%, with 10% going to both Sandberg's bluegrass and low sagebrush. As with all of the 1983 condition studies, the exact methods used are not recorded, so it is difficult to compare them to the 1998 inventory. However, it the conditions recorded during the 1983 inventory also show a scarcity of perennial grasses and a high level of weedy grasses and forbs present. In short, conditions have not improved here, like they have in most other areas in the Gerber Block. It is thought that the extreme, pre-Taylor Grazing Act grazing pressure on the areas below Woolen Canyon Rim have resulted in an irreversible loss of potential for significant future improvement.

Site BH-4: This condition study is located within the eastern portion of the South pasture, just northeast of the Bumpheads Reservoir. This study was established and read in 1998 near the BH-4 photo trend site and does not have a 1983 equivalent reading to compare back to. As with the two prior condition studies, this one is in a Shallow Stony 10-20" ecological site/vegetation community. Compared to the site description for this ecological site, BH-4 rated at 52.2% - low late-seral ecological status. This site does not have as many invasive species as the other condition study sites and perennial grasses comprise about 30% of the total vegetation. Total production (pounds/acre) is close to 400, which is above average for the Shallow Stony ecological site. In summary, this site is in good condition, though the perennial grass component should be a higher percentage of the total vegetation.

Site BH-5: This condition study is located in the western side of the North pasture, above the Woolen Canyon Rim. The study was established and read in June of 2000 and also has no 1983 reading to compare to. As with all the other study sites, this area is dominated by the Shallow Stony 10-20" ecological site. Compared to the PNC for this site, BH-5 rated at 47.5%, which is in the upper end of the mid-seral ecological status class. The perennial grasses at this site are Sandberg's bluegrass and bottlebrush squirreltail, which in total, amount to about 27% of the total vegetation. Medusahead - an exotic, invader grass species - made up about 7% of the total, and *Festuca reflexa* - an annual, native weedy grass - made up about 27% of the vegetation. The total production was a little above average 314 pounds/acre. In summary, this site is in good condition but has some weedy grasses present that could displace the native perennials over time with improper grazing management.

<u>Trend Studies</u>: Like all of the higher priority allotments in the Gerber Block, Bumpheads has several different trend studies. There are two frequency trend studies, both of which were established at existing photo trend/condition sites (BH-4 and BH-5). Both sites have only had their initial establishment readings completed - BH-4 on 8/11/98 and BH-5 on 6/13/00. When the sites have the second reading done at the five-year interval (2003 and 2005, respectively), comparisons will be made to determine the vegetation trends, though it often takes several readings (10+ years beyond establishment) to indicate a definitive trend in low response potential, arid areas such as the Gerber Block.

The other primary trend studies are the long-established photo trend plots. There are 3 of these monitoring sites in the Bumpheads allotment, all located within the South pasture. At each location a view photo and a 3' x 3' plot photo are taken. The following summarizes this study information:

Site BH-2: This study is in the west side of the South pasture. The initial plot was established in 1974 and has been re-photographed in 1976, 1977, 1978, 1980, 1981, 1983, 1984, 1985, 1986, 1993, and 1998. A plot data map and summary were also completed during 1974-83. The early photos and plot maps show only a few needlegrass (*Stipa*) and Sandberg's bluegrass plants along with a couple of low sagebrush plants. Evidence of heavy medusahead litter and plants is seen in the photos, both the plot photos and the view photos. Later photos show that the perennial grasses are still there but do not appear really vigorous. The low sage plants did increase in size, especially one that is located in the center of the plot. It was not recorded on the first photo (1974), but covered the entire center square in the later photos (1993 and 1998). The view photos show a good size increase in the junipers that are present. Several went from less than 3 feet to more than 10 feet in height during the 24-year photo span. Overall, this plot is in a downward trend due to the lack of an increase in perennial grasses, the medusahead invasion, and juniper encroachment.

Site BH-3: Site BH-3 is located below the Woolen Canyon rim in the southwest corner of the allotment. The photo point was established in 1974 and re-photographed in 1976, 1977, 1978, 1980, 1982, 1983, 1984, 1986, 1993, and 1998. The plot photos do not contain much vegetation. The early photos show two low sage plants, one larger mature clump of bluegrass, and several smaller bluegrass plants. The later photos show that one of the low sage plants died and it also appears that the large clump of bluegrass has also disappeared. The view photo of the surrounding area shows a good component of low sagebrush but the grass component is sparser than desired for this ecological site (Shallow Stony 10-20"). Notes in the file indicate that cheatgrass is common in the area. An older juniper is present in the view photo with several more of varying sizes and apparent age classes in the background. In the immediate vicinity it does not appear that the junipers are increasing to unnatural levels at this site. Overall, this site is in static to downward trend due to the apparent scarcity of native grasses and the presence of cheatgrass. (More information on this particular site is found in the Condition Studies section earlier.)

Site BH-4: Site BH-4 is located just to the northeast of the Bumphead Reservoir in the South pasture. This photo point was established in 1981 and re-photographed in 1983, 1985, 1988, 1993, and 1998. Representative vegetation in the first photo includes Idaho fescue, Sandberg's bluegrass, squirreltail, and low sagebrush along with several desirable native forbs, including *Antennaria* and *Phlox*. The 1998 photo shows an increase in size and apparent vigor of the fescue and bluegrass. The sagebrush has also increased in size with one plant that was barely visible in 1981 now nearly filling one of the plot squares. The view photo at this site shows a good sagebrush cover, though the grass cover appears to be a little sparse for the ecological site (Shallow Stony 10-20"). Litter cover in both the plot and view photos, also appears to be low. Overall, this site is exhibits a static to slightly upwards trend due to the increase in size and vigor of the plants within the plot frame. (More information on this particular site is found under the Condition Studies section earlier.)

<u>Utilization Studies</u>: Utilization monitoring has not been completed on a consistent basis in this allotment. There are 13 total monitoring points throughout the allotment. Several of the monitoring points have not been visited in recent years due to relative inaccessibility (extremely rough country). However, the points

that have been visited do give a good cross section of the allotment. Most readings were in the light to mid-moderate range (20-50%) with only a couple of readings above 50%. Observations from the individual monitoring sheets mention varying levels of exotic grasses and weedy forbs. Heavy medusahead infestations are mainly concentrated in the extreme western and southwestern portions of the pasture (utilization points 1, 2, 4, & 14). This is also reiterated in the Photo Trend, Frequency Trend, Condition studies and Ecological Site Inventory portion of this section.

Use pattern mapping is normally completed in conjunction with utilization point monitoring. Use pattern maps were completed during 1993, 1994, 1995, 1997, and 1999 with the majority of the allotment showing slight to light use. Moderate to heavy use levels have occurred around Bumphead Reservoir. The western portion of the allotment, mainly below the rim of Woolen Canyon has had consistent areas of heavy use. This area has been noted as having large areas of annual bromes and medusahead. Heavy use was made on the remaining perennials.

The narratives that accompanied the use pattern mapping discuss the weedy grass and forbs found in the extreme western portions of both the North and South pastures. The area below the Woolen Canyon rim is described as having few native perennials remaining with evidence of past heavy use. This area was historically used for sheep lambing in the spring, thus the name Woolen Canyon.

Actual Use Records: In order to correlate forage utilization with livestock use in a pasture, accurate records must be kept of the numbers of livestock and their period of use in the separate pastures. A review of past Actual Use records shows a need for better reporting.

Standards for Rangeland Health

A determination of the status of the Bumpheads allotment in regards to the 5 Standards for Rangeland Health can be made based upon this analysis of monitoring data and other information contained in this watershed analysis:

STANDARD 1 - WATERSHED FUNCTION - UPLANDS – This standard is being met on the Bumpheads Allotment. Based upon the ESI, approximately 70% of the upland vegetation in this allotment is in PFC or late seral condition. The small areas that are in mid or early seral conditions are the result of past disturbance events – early livestock overgrazing and the 1937 wildfire. The current grazing system on the allotment is not causing a continued decline in these conditions. Utilization monitoring data and use mapping has shown slight to light use throughout the allotment with some limited heavier use areas near livestock water sources – an unavoidable and acceptable impact related to livestock grazing.

The western portions of the allotment do have some areas that have been invaded by weedy grass and forb species. There are also high amounts of juniper trees in all age classes throughout the allotment. The current grazing management is not having a significant effect upon these conditions. Past disturbance events including the large 1937 wildfire, which was preceded and followed by heavy grazing, have helped contribute to the current conditions. A change in these conditions would require mechanical manipulation including juniper removal and reseeding. The current grazing utilization levels have been mainly in the light to moderate range and not contributing to continued degradation.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS - This Standard is not being met on the Bumpheads Allotment and current livestock grazing is a contributing factor. There is approximately 0.3 mile of Antelope Creek that flows through the extreme eastern edge of the South pasture. In 1996, a Proper Functioning Condition survey found this section of the creek to be in “Non-functioning” status. Notes from the survey checklist indicate that the stream section is wide and shallow with wetland vegetation present only in areas where water pools. Areas of raw banks with active lateral erosion were observed. The streambed has cut down to bedrock in this stretch.

Woolen Canyon is an intermittent drainage in the southwest corner of the allotment. Part of the spring runoff through this drainage is diverted to an irrigation reservoir on private land. There are a couple of small springs within the canyon above the drainage, but they do not contribute much to total flow. Due to the low total flow, riparian vegetation is limited to areas below the springs.

The intermittent drainages that flow into Bumphead Reservoir have been partially channelized in the past, and in some areas created, to facilitate water delivery to the reservoir. These channels normally only flow during spring snowmelt. Most of the channels have no riparian vegetation due to the lack of long-term water. Bumphead Reservoir, located in the southeast portion of the allotment, has a storage capacity of approximately 500 acre/feet. The water rights are privately held, so the BLM has no control over the amount of water in the reservoir. In recent years, the landowner has been draining most of the water to fill an irrigation reservoir on his private land although some water remains in a dugout area that is below the outlet works for the reservoir. This provides adequate water for livestock during most years. This has resulted in less than optimum conditions for maintaining fisheries in the reservoir. The riparian vegetation around the reservoir is also sparse due to the fluctuating water levels. There is a small wetland area that has formed below the reservoir dike due to leaks in the structure. This area was fenced from livestock in 1995 and the conditions in this “artificial” wetland have improved.

There are several small waterholes that have been developed in the allotment. These are usually on small ephemeral drainages that fill the waterholes during spring runoff. Riparian vegetation around these waterholes is largely nonexistent as these are the main water sources for livestock when they are in the allotment. Most of these waterholes tend to dry up by mid summer.

In summary, most of the riparian and wetland resources in the allotment are either being manipulated for irrigation uses on private lands below the allotment or have been created for livestock water within the allotment. Although, the current livestock grazing management is not having a significant detrimental effect on the majority of the riparian and wetland resources in the allotment, the short stretch of Antelope Creek needs to be fenced from livestock if conditions are to improve (see Step 6).

STANDARD 3 - ECOLOGICAL PROCESSES - This Standard is being met on the majority of the allotment. The Ecological Site Inventory completed on this allotment shows that approximately 70% of the allotment is in the late seral or Potential Natural Community (PNC) condition classes. Approximately 25% is rated as mid seral and about 5% is early seral. The late seral and PNC classes represent plant communities that have the composition and structure necessary to efficiently carry out the ecological processes of nutrient cycling and energy flow. The mid seral and early seral areas generally have lower production due to past disturbances. These areas also have some exotic annual grasses that are displacing the native perennials. These sites are not as efficient as the late seral and PNC sites in carrying out the ecological processes. .

The ESI write-ups also give information on ground cover and soil movement. Most of the sites had a good litter component and stable soil surfaces. The hydrologic cycle in the allotment has been manipulated through constructed channels and reservoirs for irrigation needs. This has led to the “de-watering” of some of the intermittent channels. As this water is controlled by private water rights, it cannot be managed by the BLM.

STANDARD 4 - WATER QUALITY - This Standard is considered to be not met because Antelope Creek does not meet Oregon water temperature standards and is 303(d) listed. See Standard 2 above for an explanation as riparian conditions are integrally linked to water quality. As riparian conditions improve (due to management recommended in Step 6) the BLM land related impacts will be reduced and progress will made towards meeting this Standard.

Water quality is currently monitored downstream from the Bumpheads allotment. As noted above the main sources of long-term water within the allotment are Bumphead Reservoir, a short stretch of Antelope Creek, several constructed waterholes, and a couple of developed springs. As stated previously, the water rights to Bumphead Reservoir are privately held and most of the water is annually run downstream to an irrigation reservoir on private land. During years when the reservoir water is used for downstream irrigation, late summer water levels are low. The actual flow amounts cannot be controlled by the BLM as irrigation diversions above this point have changed the seasonal flows. However, riparian and stream bank conditions can be affected by the BLM authorized livestock grazing within the allotment.

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES</u> - This Standard is being met on the Bumpheads allotment. The meeting of this Standard is based largely upon the conditions expressed in the previous Standards. With 70% of the ecological sites in late seral or better condition, the habitat needs of dependent native plants and wildlife are probably being met. No special status species or species of local importance are known to be within the Bumpheads allotment.

The KFRA ROD/RMP listed four specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Campbell Allotment (0878)

The Campbell *Rangeland Health Standards Assessment* was completed as a “free-standing” document in early 2002. It determined that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for maintaining the current overall good vegetation conditions. That Assessments format was different than the others referenced in this Step. Since the Assessment was relatively short, it is incorporated in the following as finalized, with only minor editing changes:

“Campbell is located about 5 miles west of Gerber Reservoir just touching the extreme western edge of the analysis area. It has about 1,465 acres of BLM land and about 3,140 acres of intermingled private lands. The Goodlow Rim splits the allotment into two distinct portions. Throughout this assessment the two geographically disconnected portions of this allotment will be referred to as the “upper portion” and the “lower portion.” The upper portion is the area above the Goodlow Rim and the lower portion is the area below the Goodlow Rim. Campbell is a “C” category allotment for monitoring purposes and as such, there are no current range monitoring studies established. The information and observations from the completed Rangeland Health Evaluation Summary Worksheets and the input of resource specialists was used to determine whether this allotment is meeting the five Standards for Rangeland Health.

<u>STANDARD 1 - WATERSHED FUNCTION-UPLANDS</u> - An Ecological Site Inventory (ESI) has not been completed on this allotment. The upper portion of the allotment would likely have multiple ecological sites as defined by the ESI. These would include: Pine-Mahogany-Fescue 16-20", Shrubby Loam 16-20", Ephemeral Lakebed, and possibly a Juniper-Mahogany-Fescue 16-20"site. The Ecological Sites in the lower portion of the allotment would likely include Shallow Stony 10-20", Shrubby Loam 16-20", and Juniper Claypan 16-20".

The upper portion of the allotment supports a very healthy mountain big sagebrush community with a vigorous perennial grass component dominated by Idaho fescue. Other common shrub species in the area include mountain mahogany and antelope bitterbrush. Throughout the upper portion there are also ponderosa pine stands of varying densities with mountain mahogany and an understory of Idaho fescue, bluebunch wheatgrass, several bluegrass species, and various forbs. Scattered throughout both the sagebrush and pine communities are western junipers of various age classes. There is what would be considered “old growth” junipers present, but there appears to be an increasing level of young junipers that are beginning to have negative effects on the vegetation communities. In the big sage areas, the increase in younger junipers is resulting in a decrease in the sage as evidenced by the higher amounts of dead sage remnants. Throughout the upper portion, there is little evidence of recent livestock use, timber harvest or other surface-disturbing activities. One small area has had some of the junipers removed from a mountain mahogany stand within the last 3-10 years. With the good vegetation conditions and general lack of disturbance, there is more than adequate protection for the soil resource in the upper portion of the allotment. The vegetation community is providing good plant cover and litter distribution, which in turn is supplying organic matter to the soil. No soil erosion problems were noted during the field observations.

The lower portion of the allotment has both low and big sagebrush communities. The big sage community basically parallels the bottom of the Goodlow Rim. Both pine and juniper trees are found throughout this stretch in varying densities. Most of the area would be a Shrubby Loam 16-20" ecological site with some areas of Pine-Mahogany-Fescue 16-20". Both of these potential sites are invaded and negatively affected by junipers. In areas of dense juniper, the shrub component is either missing or only barely hanging on. There were lots of dead sagebrush and mahogany remnants in these areas. Perennial grass species were also very sparse in these areas. In the more open areas that lacked juniper, there were good stands of mountain big sagebrush with perennial grasses including bluebunch wheatgrass, Idaho fescue, and bluegrass species. In the few pine areas without many junipers, there were good stands of mountain mahogany with some antelope bitterbrush scattered throughout and a good understory of mixed perennial grasses.

The changing vegetation communities within the dense juniper areas are negatively affecting the soil resources. There are large bare soil areas within these juniper stands with some cover of juniper needles immediately under the trees. The lack of shrubs and grasses in these areas is resulting in increased potential for soil loss. The root structures of the shrubs and grasses would provide soil holding capabilities as well as additional litter cover. The water flow patterns and potential infiltration are also being negatively affected by the dense overstory of junipers.

The low sage community is located to the west of the Goodlow Rim in portions of sections 13 and 14. Most of this area would be classified by ESI as either Shallow Stony or Juniper Claypan. The vegetation in these areas is dominated by low sagebrush and Sandberg’s bluegrass. Many areas have been invaded by exotic annual brome species (i.e. cheatgrass). There are also areas with native annuals including Vulpia and annual hairgrass (Deschampsia) at higher than desired levels for these ecological sites. These annual species, both native and exotic, appear to be having a negative effect on the amount and vigor of the low sagebrush. Soil loss in these areas does not appear to be a problem. The species that are present are providing good surface protection. The surface also has a high amount of rocks and gravels that armor the soils from raindrop impact and runoff.

Current livestock grazing in the allotment is not having a negative impact on the uplands. The water sources below Goodlow Rim are all located on adjacent private lands. The BLM lands are receiving minor use as the animals trail through. The upper portion of the allotment does not appear to receive much grazing by livestock due to the physical barrier of the rim.

This Standard is currently being met on this allotment. The increase in junipers is beginning to have a negative impact on some of the vegetation communities and active management of these areas should be pursued. Current livestock use in the allotment is not creating significant impacts.

STANDARD 2 - WATERSHED FUNCTION-RIPARIAN/WETLAND AREAS - Within the Campbell allotment, there are a limited number of riparian areas. In the upper portion, Pankey Lake is a shallow reservoir that appears to hold water into early summer in average years. About ½ of the reservoir is on BLM lands with the remainder on Forest Service land. The current vegetation in the reservoir bottom is in good condition, dominated by spikerush and sedge species. There are also several small intermittent and ephemeral drainages in the allotment. Some of these have had waterholes constructed across them on the private lands. These drainages generally lack any riparian vegetation due to the short duration of the spring runoff periods. Most of the channels in the lower portion have low gradient channels with vegetation similar to the adjacent uplands and many are well armored by rock. These physical characteristics in combination with the short runoff periods result in relatively small, stable channels. No Proper Functioning Condition (PFC) surveys have been completed for any of the stream segments or wetlands in the allotment. The only stream segment that may support riparian vegetation would be the one that drains out of Pankey Lake. This segment was not visited during the evaluation. Considering the excellent conditions of the surrounding uplands and the relative lack of disturbance factors, this channel is likely in good condition. However, a field survey of this channel could be completed in the near future.

This Standard is currently being met on this allotment.

STANDARD 3 - ECOLOGICAL PROCESSES - As discussed under Standard 1, most of the vegetation communities in this allotment have good plant composition and community structure. A small portion of the allotment below the Goodlow Rim is being invaded by junipers, which are having some negative effects on both the composition and structure. This is also having a negative effect on the soils in this area. With the declining amounts and varieties of shrubs and grasses in these thick juniper stands, there is a corresponding decrease in the surface litter and organic matter being incorporated into the soil and the root occupancy in the soil profile. The decreased diversity of species within these stands is also negatively affecting the total biological activity including plant growth, herbivory, and rodent, insect and microbial activity. In the upper portion of the allotment the vegetation communities are presently in late seral or PNC condition. There are small junipers that are starting to invade some of the pine and sagebrush vegetation communities. If these areas are not managed to slow the juniper increase, a shift in conditions to a lower ecological state may occur.

The majority of this allotment is meeting this Standard. Good vegetation communities are present that are allowing the various ecological processes of energy flow and nutrient cycling to occur. There are also no known populations of noxious weeds in the allotment. The small area with the dense juniper stands should receive treatment in the near future to recover the community structure and composition. Treatment of the junipers in the upper portion should also be considered.

STANDARD 4 - WATER QUALITY - As stated under Standard 2 above, there are a limited number of surface water features in the Campbell allotment. Pankey Lake, a shallow reservoir in the northeast corner of the upper portion of the allotment is filled by snowmelt during the spring runoff period. In an average year, it would have some water until mid-summer. Most of the year, due to its shallow nature, it would be classified as a seasonal wetland. The vegetation community is in good condition and dominated by spikerush and sedge species. There appears to be little livestock use of this area due to its position above Goodlow Rim. Most livestock activity is below the rim. Some of the intermittent drainages in the allotment have water catchments on them on the private land. These have minor effect on the BLM portions of these drainages. These small drainages flow in response to snowmelt and spring runoff and then dry up for the remainder of the year. Due to these short-term flows, these drainages have vegetation that is similar to the surrounding uplands.

No water quality studies have been completed on the allotment due to the short-term nature of the water features. This Standard is being met on the Campbell allotment.

STANDARD 5 - NATIVE, T&E, AND LOCALLY IMPORTANT SPECIES - The different plant communities discussed under Standard 1 are all in good condition, except for a small area that is being affected by increasing juniper populations. The composition, age class distribution, and productivity of these communities are providing a range of habitats to support the animal and plant species that depend upon them. The lower portion is considered big game winter range. Treatment of the invading junipers to maintain a healthy sage and mountain mahogany community would benefit these species. There are no known Special Status species in the allotment. This Standard is being met in the Campbell allotment. The current livestock use in the allotment is not having a negative affect on the plant and animal communities."

The KFRA ROD/RMP listed one specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

DeVaul Allotment (0879)

DeVaul is a small, low priority allotment located on the extreme northwestern edge of the Gerber Block. Due to a lack of effective division fencing, this allotment is grazed in common with the private lands in and around DeVaul Lake. The BLM administered lands are primarily pine/juniper-dominated uplands with limited livestock grazing appeal or use, though cattle may be present into the fall. The public land areas are primarily used to trail through or for shading during the day. Due to the allotment's low priority, apparent lack of past resource problems, and intermingled ownership, typical rangeland monitoring studies have not been established. However, some other useful resource information has been collected in recent years - an explanation of which follows:

Ecological Site Inventory: During the 1997 field season, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Total DeVaul Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	352.56	0	0
Pine-Mahogany-Fescue	0	146.81	0	0
Stony Claypan	16.65	3.38	0	0
Shallow Stony	15.81	77.97	0	0
Shrubby Loam 16-20"	0	7.26	0	0
Ephemeral Lakebed	62.21	0	0	0
Totals*	94.67	587.98	0	0

*Acres breakdown: public - 55.4%, private - 44.6 %

Condition Classes	% of total classified
Potential Natural Community	13.9%
Late Seral	86.1%
Mid Seral	0%
Early Seral	0%

As the above table shows, the entire allotment was classified as either late seral or PNC. The PNC Ephemeral Lakebed area is primarily private land (57.6 acres of the 62.2 acre total) but was judged to be in excellent condition and thus "functional". The majority of the allotment – public and private – is comprised of the two pine sites: Pine-Sedge-Fescue and Pine-Mahogany-Fescue. Though rated as late seral, both sites on this allotment were found to have ecological conditions depressed due to recent under burning (which has removed most of the understory shrub component), less recent timber harvest activities, and probably past grazing use. These sites have also experienced some of the mountain mahogany die-off noted elsewhere in this analysis. The ESI estimates of apparent trend were static to upwards; appropriate trends given the vegetation types and relatively elevated existing ecological conditions. The ESI estimated Soil Surface Factor (SSF) ratings were "Stable" to "Slight" implying very limited current soil erosion activity.

Other Upland Monitoring/Information: A Rangeland Health Evaluation was performed and Summary Worksheet prepared on this allotment October 24, 2000. The evaluation worksheet was done in an area that is a mix of the two pine ecological sites. That field assessment rated the soil site stability and hydrologic function at "none to slight" departure from site potential. The biotic integrity, however, was estimated as moderately departing from site potential for reasons, to quote the assessment, that were *"...primarily attributable to the under burning and to a more limited degree, past logging and grazing use."* The memo accompanying the Worksheet also stated the following:
"A minor component of the area are (sic) scattered patches – in between the pine areas – of Juniper Claypan 16-20" ecological site vegetation. These areas varied in condition from mid seral to late/PNC. The one juniper area near our Health Assessment was in mid-seral with too many annuals and a paucity of perennial grasses. Others noted in our loop around drive looked to be in better condition. Other observations:
-Early seral ("pioneer") mosses were in evidence, particularly out in the open areas.
-Cheatgrass was ample, though not thick; particularly under the burned pine areas.

Overall, the BLM lands in this allotment exhibit suppressed conditions – little of which appears attributable to current livestock grazing…"

Overall, the Summary Worksheet ratings indicate at least adequate - and probably better - rangeland health and functionality, and little if any, risk of future degradation with current livestock grazing management.

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: Standard Met. The only riparian/wetland area on this allotment is DeVaul Lake, which is on private lands. The ESI found the conditions to be excellent implying a high degree of functionality. Based on the elevated upland conditions, grazing management appears appropriate and not contributing to offsite riparian/wetland problems.

STANDARD 3 - ECOLOGICAL PROCESSES: Standard Met. The high seral state vegetation communities found on this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: Standard Met. There are no 303(d) listed waters within this allotment. There are no perennial waters on the public lands in this allotment - livestock water is provided on the private lands. In addition, the elevated ecological state of the current vegetation implies that grazing management is appropriate and not contributing to offsite water quality problems.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*. As noted in Step 3, the KFRA ROD/RMP listed one specific “Identified Resources Conflicts/ Concerns” and related “Management Objectives” for this allotment. It dealt with riparian habitat and was relevant to the small corner of BLM administered land, which edges into DeVaul Lake. As already noted, this area was determined during the ESI to be in excellent condition. This Land Use Plan objective is considered as being met with current grazing management.

Goodlow Allotment (0881)

This is a small, low priority allotment that is located immediately north of the DeVaul allotment. For years this allotment was unfenced from the private lands and grazed in common with it throughout the season. In the mid 1990’s the privately owned lands were fenced, allowing for more off-season control of the livestock. Since there has been no livestock water available on the BLM lands, the gates between public and private have been left open during the season of use and cattle allowed to drift in and out. However, during the fall of 2000 a catchment water hole was dug on the extreme north end of the BLM and appears to be a viable water retaining facility. This should allow for discrete use of the Goodlow allotment in the future. Due to the allotment’s low priority, apparent lack of past resource problems, and historically intermingled ownership, typical rangeland monitoring studies have not been established. However, some other useful resource information has been collected in recent years - an explanation of which follows:

Ecological Site Inventory: During the 1997-98 field season, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Total Goodlow Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	159.83	0	0
Pine-Mahogany-Fescue	0	66.55	0	0
Stony Claypan	129.99	0	0	0
Shallow Stony	0	495.45	0	0
Shrubby Loam 16-20"	0	89.15	0	0
Totals*	129.99	810.98	0	0

*Acres breakdown: public - 35.3%, private - 64.7 % Allotment also contains 47.96 acres of unclassified private lands not in the totals.

Condition Classes	% of total classified
Potential Natural Community	13.8%
Late Seral	86.2%
Mid Seral	0%
Early Seral	0%

The ecological conditions of this allotment’s vegetation communities - public and private combined - are all late seral/PNC. All the allotment’s ecological sites in these condition classes are believed to be appropriately functional upland communities. More specifically, if considering just the BLM administered lands in Goodlow (approximately 350 acres according to the GIS data base), 10% of the vegetation was PNC and 90% was found to be late seral. The late seral areas were determined to be primarily Shallow Stony 10-20" and a smaller mix of the two pine sites. The Shallow Stony areas had a high percentage composition (59%) of native perennial grasses, appropriate amounts of native shrubs (25% composition), and an exceptionally high diversity/quantity of native forb species (21 species and 15% of the composition). This is exceptional biotic diversity that implies a high level of hydrologic function and soil site stability. The pine sites would be as described for DeVaul and in appropriate condition. The small, scattered areas of the Stony Claypan ecological sites were in PNC condition and exhibiting full upland functionality (see next section). The ESI estimates of apparent trend were static to upwards; appropriate trends given the vegetation types and elevated existing ecological conditions. The ESI estimated Soil Surface Factor (SSF) ratings for all the sites were "Stable" to "Slight" implying very limited current soil erosion activity.

One other ESI related observation is associated with the Shrubby Loam 16-20" ecological site area, located along the eastern edge of the allotment. This area is a mix of public and private lands split by the south allotment fence. The area was ESI classified during the summer of 1998 and then the BLM portion (about half of the site) north of the fence was burned (prescribed fire) during the fall of 1998. Prior to burning the condition was late seral (almost PNC) with very high productivity and a very nice stand of mountain big sagebrush (18% composition), bitterbrush (17%), and mix of native perennial grasses (39%). After burning, virtually all of the shrubs were eliminated and are not expected to fully return for many years since neither big sagebrush nor bitterbrush are very successful respouters. The grasses have resprouted nicely though an increase in annuals was noted the following year. This area will be informally monitored (i.e. field observations with a view photo point) to see how the conditions respond over time; the unburned area south of the fence will act as a comparison area.

<u>Other Upland Monitoring/Information</u>: A Rangeland Health Evaluation was performed and Summary Worksheet prepared on this allotment October 24, 2000. The evaluation worksheet was done in the northwest portion of the allotment in an area that is primarily the Stony Claypan 14-20" ecological site. That field assessment rated all three of the allotments "Rangeland Health Attribute" categories (soil site stability, biotic integrity, and hydrologic function) at "none to slight" departure from site potential; in other words, the allotment is in excellent condition overall. The only aberrations noted were an increase in juniper in the vicinity and the presence of some limited tarweed (*Madia*) – a native, weedy, increaser species.

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

<u>STANDARD 1 - WATERSHED FUNCTION – UPLANDS</u>: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

<u>STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS</u>: Standard Met. There are no riparian/wetland areas on the BLM administered lands (all on the now separately fenced private lands). The elevated ecological state of the current vegetation implies that grazing management is appropriate and not contributing to offsite riparian/wetland problems.

<u>STANDARD 3 - ECOLOGICAL PROCESSES</u>: Standard Met. The high seral state vegetation communities found on this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

<u>STANDARD 4 - WATER QUALITY</u>: Standard Met. There are no 303(d) listed waters within this allotment. Historically, there has been no perennial livestock water on the public lands in this allotment - livestock water was provided on the adjacent private lands. However, the recent pond construction changes that, though this small dug out pond should not significantly change water quality in the area. In addition, the elevated ecological state of the current vegetation implies that grazing management is appropriate and not contributing to offsite water quality problems.

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES</u>: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*. The KFRA ROD/RMP did not identify any specific "Identified Resources Conflicts/ Concerns"related to the livestock grazing on this allotment

Horsefly Allotment (0882):

The Horsefly allotment is the largest (over 12% of the Resource Area) and probably most important grazing allotment within the KFRA. As noted in Step 3, this allotment has a 9-pasture, rest-rotation grazing system with the permitted use split into two seasons: spring/early summer (70%) and fall use (30%). It is also under section 7 consultation relative to the endangered shortnose sucker. (See Step 3 for more grazing information.) The allotment's *Rangeland Health Standards Assessment* was completed in 1999 and found that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for maintaining the current overall good vegetation conditions. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized as necessary in the following narrative. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health, which is found at the end of this section. Some additional monitoring information has also been collected since completion of the Assessment and will be discussed.

Ecological Site Inventory: Since Assessment completion, the ESI vegetation information has been refined so that a very accurate figure is available - by pasture - for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres by pasture has also been calculated to a reasonably accurate level. That information is summarized as follows:

Schnipps Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	572.13	73.92	0
Pine-Mahogany-Fescue	15.2	796.33	0	0
Juniper Claypan 16-20"	846.77	615.57	0	0
Stony Claypan 14-20"	42.49	3.37	0	0
Shallow Stony 10-20"	17.70	456.01	0	0
Dry Meadow	0	34.81	0	0
South Slopes 14-18"	0	7.65	0	0
Mahogany Rockland	0	31.77	0	0
Wet Meadow	0	31.00	0	0
Totals*	922.16	2548.64	73.92	0

*Classified acres breakdown: public – 100%, private - 0 % Allotment also contains 25.42 acres of rock not included in the totals. Total pasture size is approx. 3570 acres.

Condition Classes	% of total classified
Potential Natural Community	26.0%
Late Seral	71.9%
Mid Seral	2.1%
Early Seral	0%

Adobe Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	7.72	0	0
Pine-Mahogany-Fescue	0	62.0	0	0
Juniper Claypan 16-20"	688.15	1174.18	88.17	0
Juniper Claypan 12-16"	0	0	764.12	0
Stony Claypan 14-20"	0	173.95	0	0
Shallow Stony 10-20"	122.5	0	218.04	0
Ephemeral Lakebed	136.94	0	0	0
Irrigated Stony Claypan	543.06	0	0	0
South Slopes 14-18"	0	26.44	133.93	0
Totals*	947.59	1444.29	1204.26	0

*Allotment also contains 74.22 acres of rock not included in the totals. Total pasture size is approx. 3670 acres.
Acres breakdown: public - 100%, private - 0 %

Condition Classes	% of total classified
Potential Natural Community	26.3%
Late Seral	40.2%
Mid Seral	33.5%
Early Seral	0%

Copeland Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	19.02	0	0
Pine-Mahogany-Fescue	0	22.22	0	0
Juniper Claypan 16-20"	1460.25	1663.18	891.27	0
Juniper Claypan 12-16"	0	54.57	38.56	0
Shrubby Loam 16-20"	0	57.94	0	0
Stony Claypan 14-20"	1.49	445.27	0	0
Claypan 14-20"	0	0	139.36	0
Shallow Stony 10-20"	0	17.88	11.00	0
Ephemeral Lakebed	121.37	68.74	0	0
Dry Meadow	0	122.1	0	0.56
Irrigated Stony Claypan	0	0.56	0	0
Juniper Mahogany Fescue	0	41.58	28.92	0
Claypan Bottom	0	52.42	0	0
Totals*	1583.11	2565.48	1109.11	0.56

Acres breakdown: public - 100%, private - 0 % *Total pasture size is approx. 5258 acres.

Condition Classes	% of total classified
Potential Natural Community	30.1%
Late Seral	48.8%
Mid Seral	21.1%
Early Seral	0%

Round Valley Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	177.25	26.99	0
Pine-Mahogany-Fescue	0	579.34	0	0
Juniper Claypan 16-20"	2729.85	268.81	0	0
Shrubby Loam 12-16"	0	5.34	0	0
Stony Claypan 14-20"	0.95	1045.87	0	0
Claypan 14-20"	0	8.84	0	0
Shallow Stony 10-20"	0.48	304.13	0	0
Ephemeral Lakebed	13.95	24.53	0	0
Dry Meadow	0	52.12	0	38.89
Mahogany Rockland	0	20.23	0	0
Totals*	2745.23	2486.46	29.99	38.89

*Allotment also contains 10.08 acres of rock not included in the totals. Total pasture size is approx. 5310 acres. Acres breakdown: public – 98.4%, private – 1.6 %

Condition Classes	% of total classified
Potential Natural Community	51.8%
Late Seral	46.9%
Mid Seral	0.6%
Early Seral	0.7%

Wild Horse Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	0	3.48	0
Pine-Mahogany-Fescue	2.88	0	0	0
Juniper Claypan 16-20"	391.46	0	0	0
Stony Claypan 14-20"	1.49	550.11	0	0
Shallow Stony 10-20"	5.23	631.83	0	0
Ephemeral Lakebed	121.37	68.74	0	0
Irrigated Stony Claypan	7.47**	0	0	0
Mahogany Rockland	0	2.58	0	0
Totals*	408.52	1184.52	3.48	0

*Allotment also contains 1.29 acres of rock not included in the totals. Total pasture size is approx. 1598 acres. Acres breakdown: public - 100%, private - 0%

Condition Classes	% of total classified
Potential Natural Community	25.6%
Late Seral	74.2%
Mid Seral	0.2%
Early Seral	0%

Round Valley W.S. Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	26.45	0	0
Pine-Mahogany-Fescue	0	30.9	0	0
Juniper Claypan 16-20"	149.56	22.08	0	0
Stony Claypan 14-20"	108.4	224.66	0	0
Shallow Stony 10-20"	379.93	262.21	0	0
Irrigated Stony Claypan	543.06**	0	0	0
Totals*	1180.96	566.3	0	0

Total pasture size is approx. 1747 acres. Acres breakdown: public - 100%, private - 0 %

**The rating for the irrigated Stony Claypan is actually a forage composition condition rating of the seeded and irrigated areas within this pasture, rating the dominance the desired seeded vegetation compared to total vegetation composition; in this case at least 75% of the total composition and thus the PNC – or "excellent" – condition rating.

Condition Classes	% of total classified
Potential Natural Community	67.6%
Late Seral	32.4%
Mid Seral	0%
Early Seral	0%

Norcross Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	4.64	2169.01	0
Pine-Mahogany-Fescue	39.98	867.67	0	0
Juniper Claypan 16-20"	837.75	567.97	0	0
Stony Claypan 14-20"	518.25	446.58	0	0
Shallow Stony 10-20"	36.93	950.91	0	0
Ephemeral Lakebed	0	14.9	0	0
Dry Meadow	0	40.27	0	0
Shrubby Loam 16-20"	0	92.29	0	0
Totals*	1432.91	2985.23	2169.01	0

Within the Long Branch exclosures there are also 12.52 classified upland acres and 31.86 acres of unclassified BLM riparian acres not included in the totals. Total pasture size is approx. 6631 acres. Acres breakdown: public – 85.2%, private – 14.8 %

Condition Classes	% of total classified
Potential Natural Community	21.8%
Late Seral	45.3%
Mid Seral	32.9%
Early Seral	0%

Barnes Valley Riparian Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	170.55	170.74	0
Pine-Mahogany-Fescue	78.27	160.14	0	0
Stony Claypan 14-20"	126.25	41.70	0	0
Juniper Claypan 16-20"	36.29	69.69	0	0
Shallow Stony 10-20"	0	85.72	0	0
Totals*	240.81	527.8	170.74	0

*Acres breakdown: public – 99.8%, private – 0.2% Allotment also contains 25.42 acres of unclassified BLM riparian not included in the totals. Total pasture size is approx. 939 acres.

Barnes Inlet Pasture - Horsefly Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	81.56	0	0
Juniper Claypan 16-20"	237.44	1066.39	0	0
Shrubby Loam 16-20"	0	0.9	0	0
Stony Claypan 14-20"	106.5	15.33	0	0
Shallow Stony 10-20"	0	119.89	0	0
Totals*	343.94	1284.07	0	0

Allotment also contains 1.44 acres of unclassified BLM riparian not included in the totals. Total pasture size is approx. 1629 acres. Acres breakdown: public – 89.8%, private – 10.2 %

Condition Classes	% of total classified
Potential Natural Community	78.9%
Late Seral	21.1%
Mid Seral	0%
Early Seral	0%

Total Horsefly Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	1059.32	2445.70	0
Pine-Mahogany-Fescue	136.33	2519.91	0	0
Juniper Claypan 16-20"	7377.52	5457.97	979.44	0
Juniper Claypan 12-16"	0	54.57	802.68	0
Shrubby Loam 16-20"	0	151.13	0	0
Shrubby Loam 12-16"	0	5.34	0	0
Stony Claypan 14-20"	908.63	2946.84	0	0
Claypan 14-20"	0	8.84	139.36	0
Shallow Stony 10-20"	562.77	2835.43	229.04	0
Ephemeral Lakebed	272.26	108.17	0	0
Dry Meadow	0	249.30	0	39.45
Irrigated Stony Claypan	550.53	0.56	0	0
Juniper Mahogany Fescue	0	41.58	28.92	0
South Slopes 14-18"	0	34.09	133.93	0
Mahogany Rockland	0	54.58	0	0
Claypan Bottom	0	52.42	0	0
Totals*	9808.04	15580.05	4759.07	39.45

Acres breakdown: public - 93.1%, private - 6.9 %

Condition Classes	% of total classified
Potential Natural Community	32.5%
Late Seral	51.6%
Mid Seral	15.8%
Early Seral	0.1%

(Allotment also contains – according to GIS - 111.01 acres of defined rock outcrops, 1254.42 acres of unclassified private lands, 15.52 acres of unclassified BLM lands, and 97.58 acres of unclassified riparian along stream courses - all of which are not included in the totals.)

The ESI information above shows that the large majority (84%) of the allotment is in either late seral or PNC condition. As discussed in this Step's section on "Vegetation - Non-Forested Uplands", these seral stages are thought to be at least adequately functional in regards to the major attributes of rangeland health (i.e. soil/site stability, hydrologic function, and integrity of the biotic community) for the ecological sites that dominate this allotment.

The majority (89%) of the mid seral areas are one of two ecological types. Approximately half is Pine-Sedge-Fescue sites in the Norcross Pasture that have received extensive alterations from past timber harvest and under burning activities. Most of these sites are actually late seral areas that were "downgraded" to mid-seral due to the disturbance diminishing the understory vegetation production. These areas typically exhibit upwards trends and are thought functionally adequate. Cattle grazing is not thought to be a condition issue in these areas.

Most of the remainder of the major mid-seral areas are Juniper Claypan sites in the Copeland and Adobe pastures that are immediately adjacent to private lands below and to the southwest of Goodlow Rim. The Horsefly Assessment stated the following about these areas*: "Historically, these areas received the highest use on the allotment due to the ranch proximity and the fact that these areas are the on and off "trailing corridor" for the use of the public lands. The condition "problem" is due to excessive use that occurred decades ago. These mid-seral areas – especially in the upper ends of the class (40-50% like PNC) – are considered functional but typically lack an "ideal" plant community. However, under the current management system, these areas are exhibiting static to upwards trends. As noted earlier, it is thought that these areas have lost the potential to become PNC due to soil loss; even if grazing were totally absent for a long period of time."* (Note: During the late spring of 2001, the frequency trend plot in this area (Copeland – HF-6) was re-read. It shows that over the past 10 years (study established in 1991) the trend is definitely upwards as indicated by increases in several native perennial grass species.)

Since the two mid-seral areas compose just 12% of the Horsefly allotment's Juniper Claypan sites, exhibit static to upward trends, are receiving light use based on years of recent utilization pattern mapping, and probably have lost most of the potential (soil) to restore fully to upper late seral/PNC, current management is believed to be appropriate.

<u>Other Condition Studies</u>: Key area based condition studies (5) were informally established in 4 different pastures in 1983. All of these were relocated as close as possible (they were not permanently marked in 1983) in the mid to late 1990's and re-read. Both readings were compared using the most current ecological site descriptions. All of these studies found that ecological conditions have improved – sometimes significantly. These studies help form the basis for the conclusion that vegetation trends are generally upwards, albeit slowly – a trend inclination which is consistent with the thin soils, arid conditions, and already elevated ecological conditions.

<u>Trend Studies</u>: There are several different trend studies on the allotment – photo trend and frequency trend. The photo trend studies are the longest-term studies in the area having been established between 1968 and 1975. The photos have been retaken many times since establishment and give a good - though subjective - picture of vegetation changes over time. To quote the Horsefly Assessment, "*A comparison of the photographs, although a qualitative comparison, shows that vegetative conditions have improved slowly since establishment. The photos show that perennial grass, forb, and to some extent shrub, density and vigor has increased…*" This is good evidence of upward trends in ecological conditions and supports the similar ESI related observations.

The frequency trend studies were established between 1991 and 1995 in 5 different pastures, which stratify the allotment well. These studies are typically read every 5 years and all have been read once since the original reading. All 5 show that trends on desired grass species are static to upwards - varying with the species and specific study - and also supports the appropriateness of the current livestock management. As an example, the frequency study in the allotment's poorest condition area (ESI determined on the west side of the Copeland Pasture below Goodlow Rim) has shown increases in desired native perennial grasses between 1996 and 2001 - solid evidence that the trend is upward.

Utilization Studies: Utilization has been periodically read on the Horsefly allotment since the mid-1980's, with use pattern mapping done since the early 1990's. To quote the Horsefly Assessment, "*The utilization data from the established points has shown overall appropriate (moderate or less) average upland utilization - particularly since 1992. The utilization pattern mapping - done 5 separate years since 1992 - has also confirmed consistently acceptable overall patterns of use throughout all pastures of this allotment. The light-moderate utilization levels are within the KFRA ROD/RMP parameters and indicate long-term stability and grazing pressure that is appropriate to maintaining the good vegetation conditions. Even though occasional points in occasional years have shown heavy use, there appear to be no chronically overused areas*." Utilization levels have been, and continue to be, appropriate for maintaining static to slowly improving ecological conditions.

Other Upland Monitoring/Information: During the ESI survey, Soil Surface Factor (SSF) ratings were made. The following is quoted from the Horsefly Assessment regarding SSF - "*As a collateral observation during the ESI, the SSF was estimated for each soils/vegetation site write-up area. Although the field data have not been compiled and input into a database…(*still true*), a check of all the inventory worksheets and field maps shows that the majority of the allotment acreage (90%+ on an estimated acres weighted basis) is in either the "stable" or "slight" erosion condition classes. Specifically, 44 of the 58 ESI worksheets estimated the erosion in these two categories. These two lowest erosion classes imply generally stable conditions. The remaining areas (14 worksheets) were mostly in the low end of the "moderate" erosion class. The highest rated area (highest erosion condition class) was mid moderate and located in the poorer condition areas discussed earlier - on the extreme western side of the Copeland and Adobe pastures. As with the ecological site rating, the SSF reflects past use of the area. Vegetative information points towards this area having a slow upwards trend*."

During the ESI, a qualitative rating of the cryptogamic – or biological soil - crusts was made while collecting other vegetation data. These soil surface crusts contribute to a number of functions in the environment including soil stability, nitrogen fixation, nutrient contributions to plants, soil-plant-water relations, infiltration, seedling germination, and plant growth. There is also evidence that good biological crusts inhibit the spread/density of undesirable exotic annual grasses – a potentially distinct benefit. The following information on biological crusts is from the Horsefly Assessment – "*Another secondary observation made during the ESI was a general rating of the existing cryptogamic crusts (a ranking system recommended for ESI, by Jane Belnap, a noted NPS expert on crusts) from between the lowest rating of 0 ("bare ground") to the highest of 10 ("Cyanobacteria, big bumps, lots of lichens and mosses - >20%" (cover)). The average rating (non-acres weighted) for the Horsefly allotment was just over 4.5 - a moderate crust rating. This would be considered neither exceptional or unacceptable, but adequate, given the limited knowledge of these crusts and the long historical use of the allotment for cattle grazing. From an ecological site description perspective, the more a site was dominated by low sagebrush and grasses (majority of the allotment) the higher the crust rating tended to be. Conversely, the more a site was dominated by big sagebrush and/or pine, the lower the rating. The crust ratings for the juniper sites were in the middle of these other two groups*." During the reading of the frequency trend studies, the cryptobiotic crust components (by morphological class) are now also read, allowing for a relative abundance rating to be made. As more information is collected over time, this information will be useful for future condition evaluation.

Riparian Monitoring: Numerous riparian related monitoring studies have been completed on this allotment, primarily due to its importance in providing habitat for the endangered shortnose sucker. This includes long-term riparian photo points, stream bank stability ratings, riparian utilization, stream cross-section and greenline riparian vegetation plots, and proper function condition (PFC) determinations. A complete summary of the riparian monitoring is found in the Horsefly Assessment and will not be repeated in this section. Also see the *Riparian* and *Stream Channel* sections of this analysis. However, the analysis of the riparian information in the Horsefly Assessment did come to the conclusion that riparian/wetland areas in the allotment are either in proper condition or are adequately trending towards the proper resource conditions with current management.

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following conclusions in regards to the 5 Standards for Rangeland Health (explanation statements summarized from Assessment analysis):

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: This standard is being met on the allotment. The overall upward trends and existing high seral state vegetation communities dominating this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: This standard is being met on the allotment. Though this allotment has had past riparian problems, grazing management changes (including pasture fencing and quick rotations) made over the last 10-20 years have allowed these areas to improve significantly with the trends still upwards – particularly Barnes Valley Creek - probably the most important drainage in the Gerber Block.

STANDARD 3 - ECOLOGICAL PROCESSES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: This standard is not being met. Barnes Valley Creek, Long Branch Creek, and Miller Creek - which forms the boundary between Horsefly and the neighboring Dry Prairie allotment - do not meet the state standards for summer water temperatures. The inability to “meet” the water temperature standard on Barnes Valley and Long Branch creeks is primarily a function of the naturally intermittent (summer/fall) nature of both creeks. The flows and temperature of Miller Creek are a function of the Gerber Dam and Reservoir over which the BLM has no control. BLM administered livestock grazing is not presently considered a factor in the non-attainment of this Standard.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate. The Section 7 consultation for the shortnose sucker, over the past 7-8 years, has also affirmed that current grazing management is consistent with maintenance and improvement of aquatic habitat.

As noted in Step 3, the KFRA ROD/RMP listed nine specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Horton Allotment (0883)

Horton is a small allotment located on the extreme west central edge of the watershed analysis area. As the allotment is physically outside of the Gerber Block, it was not Ecological Site Inventoried during the noted 1997-98 survey. Due to the detachment from the Gerber Block, this allotments *Rangeland Health Standards Assessment* was completed as a “free-standing” Assessment in 2002, separately from this watershed analysis. That Assessment did find several of the Standards not fully met, but determined that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for making significant progress towards meeting the unmet Standards. Juniper invasion of big sagebrush and bitterbrush sites was determined to be the primary reason for unmet Standards.

The Assessment was based on some monitoring and observational information collected in recent years. A condensed summary of this information is presented in the following narrative:

Rangeland Health Evaluation: The Horton Assessment noted the following about the upland PFC rating done on the allotment in October of 2000:

"…The Rangeland Health Evaluation Summary Worksheet (Worksheet) completed on the allotment provides a good measure of many of the indicators listed above. This evaluation was completed in an area that was considered to be representative of the majority of the allotment. There was an overstory of juniper trees with a grass understory. There were very few forbs present. Shrub species were largely absent where there was a juniper overstory. In the more open areas (without junipers) there were scattered mountain big sagebrush, antelope bitterbrush, and rabbitbrush. Native grass species included, in order of dominance, Thurber's needlegrass, bluebunch wheatgrass, Sandberg's bluegrass, and Idaho fescue. Cheatgrass was present in varying densities…

…The current vegetation conditions in the Horton allotment match the description for a deteriorated site. Western juniper has invaded the stands in varying densities, resulting in a decline in the shrub species. The grass component has shifted to dominance by the needlegrass with an invasion of cheatgrass also occurring. The distribution and variety of forb species have also been negatively affected…

…The Invasive Plant indicator was the only rating of Moderate to Extreme due to the amount of juniper invasion. Several indicators fell into the Moderate category. These indicators were: Rills; Pedestals and/or Terracettes; Bare Ground; Soil Surface Resistance to Erosion; Soil Surface Loss or Degradation; Plant Community Composition and Distribution Relative to Infiltration and Runoff; Functional/Structural Groups; Plant Mortality/Decadence; and Litter Amount. Most of these indicators were rated this way due to the heavy juniper invasion and it's adverse effect upon the vegetation community. Juniper trees are at a level where they are negatively affecting the vegetation communities' composition and production. This has also led to a change in the structure of the vegetation. All of these components have an effect on the hydrologic functions of the site. The canopy of the juniper trees is intercepting precipitation and not allowing it to infiltrate into the soil below. The extensive root systems of the junipers also extract moisture from several levels of the soil horizon, making it unavailable to other plants. These combined effects have led to a decrease in the grass and forb components and subsequent litter amounts and an increase in bare soil areas. Precipitation that is not intercepted by the juniper canopies falls directly on these bare areas since the understory cover has deteriorated. This has led to an increase in soil surface movement, especially in these bare soil areas…"

Monitoring Studies: Some utilization measurements have been done on the allotment in the mid 1980's and again recently. The following is excerpted from the Assessment relative to this information:

"The Utilization data collected shows that use was in the 40-60% range in 1985, 70-80% range in 1986, and 30-35% range in 2000. The Utilization readings completed in 1985, 1986, and 2000 did not have Actual Use reports to correlate utilization to AUMs of livestock use. Livestock numbers from the annual billing and from use supervision notes can be used to get a general idea of the level of grazing for these years. During 1985, use supervision notes showed a count of around 10 pairs in May although the permittee had requested non-use. The bill was then paid for 66 pairs including an Exchange-of-Use for 6 pairs. During 1986, field notes showed a count of 38 head during early May. No bills were found in the files for 1986. There is a general lack of good data to correlate utilization with livestock numbers for both 1985 and 1986. For 2000, the billing was for 87 head including a 16 head Exchange-of-Use. These numbers were not verified through field checks.

The Use Map completed in 2000 showed mainly light use (30-35%) throughout the allotment with small patches of moderate use in the newly cut juniper areas. This level of use is considered appropriate and should allow for improvements in vegetation community conditions."

Riparian Information: The following is from the Assessment:

"The Horton allotment is limited in its amount and size of riparian/wetland areas. There is an ephemeral drainage that flows out of the southeastern corner of the allotment. A Proper Functioning Condition survey was completed on this drainage on June 11, 2002. This survey determined that this drainage was ephemeral with no riparian vegetation present. The channel was well armored with rocks and upland-type vegetation. There was one area that had been diked in the past to hold livestock water but has since washed around one end. There were a couple of small side channels that may contribute flow in high moisture years. Within 50 feet of the property line at the south edge of the allotment, the drainage flows into an irrigation canal. Below the canal, the stream channel has been straightened and deepened to function as an irrigation canal on the private land. A juniper treatment project was completed in the area that includes a portion of the lower drainage basin for this channel. This treatment could extend into and across this drainage without any significant effects to riparian or water quality values."

The following was noted in the Assessment section on "Ecological Processes":

"A shift in vegetation species composition and community structure has occurred due to the expansion of junipers. The shrub and grass species in these juniper stands have declined due to the moisture capturing ability of the junipers. The extensive root systems of the junipers are able to extract moisture from several levels in the soil horizon and well beyond their drip line. This decline in the shrubs and grasses has led to more bare ground areas and increased soil movement during precipitation events and spring runoff. This shift in the vegetation species can also lead to a change in the habitat available to support wildlife species. General observations indicate that the allotment is utilized by deer, rabbits and other wildlife species.

With the recent juniper reduction projects that have been completed on the allotment, a shift back to more native shrubs and grasses should occur. There are enough native species present to repopulate the spaces left by the juniper removals. The current livestock numbers and early season-of-use should not have a negative impact on this process."

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps of this watershed analysis do not significantly alter the conclusions from the recently completed *Rangeland Health Standards Assessment.* That Assessment arrived at the following conclusions in regards to the 5 Standards for Rangeland Health (the actual explanation statements below in italics are excerpted from the Assessment analysis):

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: This Standard is not currently being fully met on the allotment, but significant progress is being made toward achieving it. …The present upland soils and vegetation on the Horton allotment are currently in a moderately degraded condition. Much of the allotment has been invaded by junipers. This is having a negative impact on the vegetation communities which is leading to increased runoff and subsequent soil movement. Native perennial grasses and shrubs are still abundant in most areas and the recent juniper reduction projects should allow these to increase. This anticipated increase should result in improved ground cover and soil protection. Current livestock grazing does not appear to be creating significant negative impacts. The short season-of-use should allow the grasses to complete their growth cycles and produce seeds. The many juniper reduction areas will likely provide increased forage, but also have the potential for weed problems. These areas should be monitored…

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: This Standard is being met on the Horton allotment. Current livestock grazing is having no negative impacts to the limited riparian resources in the allotment.

STANDARD 3 - ECOLOGICAL PROCESSES: Currently, this Standard is not being fully met on the allotment, but significant progress is being made toward achieving it. …A shift in vegetation species composition and community structure has occurred due to the expansion of junipers… With the recent juniper reduction projects that have been completed on the allotment, a shift back to more native shrubs and grasses should occur. There are enough native species present to repopulate the spaces left by the juniper removals. The current livestock numbers and early season-of-use should not have a negative impact on this process…

STANDARD 4 - WATER QUALITY: This Standard is currently being met on the Horton allotment. …Within the Horton allotment, there are no perennial water bodies. There is a section of intermittent stream that was discussed in Standard 2 above. This stream segment flows out of the southeast corner of the allotment and is intersected by the North Canal, a constructed irrigation delivery system. This stream segment has very little flow and the channel is well armored by rocks and upland-type vegetation and is contributing very little sediment to downstream areas…

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: Currently, this Standard is not being fully met on the allotment, but significant progress is being made toward achieving it. …There is still a good component of native plant species throughout the allotment. Junipers have increased to a level where they have negatively impacted the plant community composition and productivity… The allotment is providing a good diversity of wildlife habitat. This area is considered winter range for mule deer. The recent juniper reduction projects should result in an increase in the shrub component, mainly big sagebrush and bitterbrush that is beneficial to big game, birds and other wildlife species…

As noted in Step 3, the KFRA ROD/RMP listed three specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Pankey Basin Allotment (0884)

Pankey Basin is a low priority allotment located on the northwestern edge of the Gerber Block that is used in common with a larger amount of private land. Most of the water for the allotment is on private land, though a portion of Pankey Creek does flow across BLM lands in an area partially accessible to cattle. The BLM uplands appear to receive only limited grazing use even though the private lands are not fenced separate. The BLM allotment is the scabbier, rougher, and/or steeper lands surrounding the private.

Ecological Site Inventory: During the 1998 field season, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Total Pankey Basin Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Mahogany-Fescue	0	55.29	0	0
Juniper Claypan 16-20"	55.44	64.50	0	0
Stony Claypan 14-20"	35.47	0	0	0
Shallow Stony 10-20"	25.07	166.07	0	0
South Slopes 14-18"	0	21.68	44.68	0
Totals*	115.98	307.54	44.68	0

*Allotment also contains 40.84 acres of defined rock outcrops not included in totals. There is also a substantial amount of private lands in this allotment which were not ESI classified though are intermingled with the BLM lands. Acres breakdown: public - 100%, private - 0 %

Condition Classes	% of total classified
Potential Natural Community	24.8%
Late Seral	65.7%
Mid Seral	9.5%
Early Seral	0%

The ecological conditions of this allotment's vegetation communities are all late seral/PNC, with the exception of the small amount of mid-seral *South Slopes 14-18"* ecological site. This latter site is located on the steep, southwest facing slopes (Goodlow Rim) that define the extreme western edge of the allotment. This area was actually ESI classified as late seral but downgraded due to suppressed production. All the allotment's ecological sites in the current condition classes are believed to be appropriately functional upland communities, though the mid seral *South Slopes* site many be marginally so. Goodlow Rim is not believed accessible by Pankey Basin cattle and thus not an issue for this allotment's grazing use, though it is physically located within the defined boundaries of the allotment. This ecological site and condition rating is an extension of an ecological write-up area done several miles south in the Goodlow Rim portion of the Adobe pasture (Horsefly allotment). The write-up area was detrimentally affected long ago by livestock from the immediately adjacent private lands in Langell Valley and is making a condition comeback, albeit slow (see Horsefly ESI narrative). It is likely, however, that the small portion of this ecological site in the Pankey allotment is in elevated condition but included with the other site for convenience, since not all areas within a site write-up area were or can be inspected on the ground.

One additional note: The grazing permit for Pankey Basin was reduced by almost one-half in 1960, i.e. from 82 to 43 AUMs. This reduction was probably a significant contributing factor to the overall good upland conditions now present on the allotment.

Other Upland Monitoring/Information: A Rangeland Health Evaluation was performed and Summary Worksheet prepared on this allotment October 31, 2000. The evaluation worksheet was done in the central portion of the allotment's BLM lands in an area that is primarily the Shallow Stony 10-20" ecological site – the allotments dominant ecological site (41% of total). That field assessment rated all three of the allotments "Rangeland Health Attribute" categories (soil site stability, biotic integrity, and hydrologic function) at "none to slight" departure from site potential; in other words, the BLM administered uplands on the allotment were judged to be in excellent condition overall.

Riparian Monitoring: In September of 1997, a Proper Functioning Condition (PFC) assessment was completed for the portion of Pankey Creek on BLM lands. A team of BLM resource specialists completed this assessment on-site. The 0.7 mile of drainage on BLM was classified into two separate portions with very different conditions ratings. The lower 0.3 mile was ranked as "Proper Functioning Condition" with no trend noted. It is the portion of the creek that drops into a rocky, shrub-choked draw that plunges into the Miller Creek canyon. It is not accessible by livestock and marginally accessible by humans.

However, the upper 0.4 mile, which is immediately adjacent to the unfenced private lands and readily accessible to livestock, was rated as "Non-functional" with no trend noted. The remarks on the assessment form were as follows: "*Heavy cattle trampling on stream banks and hoof action in muddy areas. Adjacent uplands have been heavily grazed and are contributing some sediment. There are sedges, etc. in channel to help stabilize bottom, but bare stream banks that are heavily trampled. Good water flow in September from spring and reservoir above*."

The uninhibited access by livestock for a lengthy season of use has contributed to, and helps maintain, the suppressed conditions of the drainage and its riparian vegetation community. It is possible that this riparian area is slowly improving from some even more past degraded condition, though this is not possible to tell at this point. In any case, riparian conditions appear to not be adequate, though the drainage has not been monitored since 1997. A cooperative effort with the private landowner would have to be pursued to arrive at a mutually advantageous solution to this problem (see Step 6).

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

<u>STANDARD 1 - WATERSHED FUNCTION – UPLANDS</u>: Standard Met. The high seral state vegetation communities dominating the BLM administered lands within this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

<u>STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS</u>: Standard Not Met. The portion of Pankey Creek, which rated as non-functional, is significant enough to consider this Standard as not achieved. Livestock grazing use is considered the primary reason for the non-achievement of this Standard. Due to the intermingled private and public land, solutions to this problem will probably have to be pursued cooperatively (see Step 6).

<u>STANDARD 3 - ECOLOGICAL PROCESSES</u>: Standard probably overall met. The high seral state upland vegetation communities found on this allotment strongly indicate that the ecologic processes of nutrient cycling and energy flow are being met. The poor condition of a portion of the Pankey Creek riparian area implies that there could be problems with the proper functioning of the hydrologic cycle. Whether this is significant or not cannot be determined at this point.

<u>STANDARD 4 - WATER QUALITY</u>: Standard probably met. There are no 303(d) listed waters within this allotment, though Pankey Creek has not been monitored for water quality. Miller Creek - which is 303(d) listed - forms the extreme southeastern administrative boundary of the allotment, though it is physically detached from Pankey Basin by Miller Creek Rim. Grazing use on the Pankey Basin allotment is not considered a factor with Miller Creek. The elevated ecological state of the current upland vegetation on BLM administered land implies that the uplands are not contributing to offsite water quality problems. However, the poor condition of the Pankey Creek riparian area implies that there could be water quality problems. The degree to which this contributes to the 303(d) listing of Miller Creek is unknown at this time, but is likely minor.

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES</u>: Standard Met. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate. Riparian conditions are a concern, but probably not enough to make this standard not met.

Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*. As noted in Step 3, the KFRA ROD/RMP listed two specific "Identified Resources Conflicts/ Concerns" and related "Management Objectives" for this allotment. These objectives pertained to riparian conditions and water quality; both of which are addressed adequately by the Standards.

Dry Prairie Allotment (0885)

Dry Prairie is one of the largest and most important grazing allotments in the KFRA. As noted in Step 3 (see for more information) it has a 6 pasture, rest-rotation grazing system with the important riparian area - Ben Hall Creek - fenced into a separate riparian pasture with extremely limited use. This allotment has had extensive amounts of rangeland monitoring studies established and read on it over the past 30 years; particularly during the past 8 years due to the Section 7 consultation requirements. These include various condition and trend studies, utilization, and a mix of riparian related studies, in addition to the ESI survey. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999 and found that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for maintaining the current overall good vegetation conditions. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized as necessary in the following narrative. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health, which is found at the end of this section. Some additional monitoring information has also been collected since completion of the Assessment and will be discussed.

Ecological Site Inventory: Since Assessment completion, the ESI vegetation information has been refined so that a very accurate figure is available - by pasture - for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres by pasture has also been calculated to a reasonably accurate level. That information is summarized as follows:

Miller Creek Pasture - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	107.55	0	0
Pine-Mahogany-Fescue	0	201.80	20.39	0
Juniper Claypan 16-20"	559.03	0	0	0
Stony Claypan	172.50	0	0	0
Shrubby Loam 16-20"	0	66.37	0	0
Shallow Stony	0	983.33	0	0
Mahogany Rockland	0	38.81	0	0
Ephemeral Lakebed	44.33	0	0	0
South Slopes	0	29.79	0	0
Totals*	775.86	1427.65	20.39	0

*Pasture contains 56.62 acres of "Rock" not in the totals. acres breakdown: public- 93.4%, private- 4.6%

Condition Classes	% of total classified
Potential Natural Community	34.9%
Late Seral	64.2%
Mid Seral	0.9%
Early Seral	0%

Gerber Lakes - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	187.21	0	0
Pine-Mahogany-Fescue	0	2.95	0	0
Stony Claypan	256.42	0	0	0
Shrubby Loam 16-20"	0	5.71	0	0
Shallow Stony	0	1200.48	0	0
Mahogany Rockland	0	30.35	0	0
Ephemeral Lakebed	67.47	0	0	0
Totals*	323.89	1426.16	0	0

*Pasture contains 15.14 acres of "Rock" not in the totals. Acres breakdown: public-90.9%, private-9.1%

Condition Classes	% of total classified
Potential Natural Community	18.5%
Late Seral	81.5%
Mid Seral	0%
Early Seral	0%

Ben Hall Pasture - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	799.65	0	0
Pine-Mahogany-Fescue	0	41.43	20.39	0
Juniper Claypan 16-20"	412.06	0	0	0
Stony Claypan	301.16	0	0	0
Shrubby Loam 16-20"	0	0	23.28	0
Shallow Stony	1003.84	146.72	0	0
Ephemeral Lakebed	0.37	0.09	0	0
Dry Meadow	0	0.54	0	0
Totals*	1717.43	988.43	23.28	0

*Acres breakdown: public – 93.3%, private – 6.7 %

Condition Classes	% of total classified
Potential Natural Community	62.9%
Late Seral	36.2%
Mid Seral	0.9%
Early Seral	0%

Dry Prairie Pasture - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	321.71	0	0
Pine-Mahogany-Fescue	0	60.25	0	0
Juniper Claypan 16-20"	20.87	0	0	0
Stony Claypan	232.97	0	0	0
Shrubby Loam 16-20"	0	75.07	25.06	0
Shallow Stony	25.06	1079.95	0	0
Ephemeral Lakebed	497.71	0	0	0
Dry Meadow	0	38.50	26.27	0
Totals*	776.61	1575.48	51.33	0

*Allotment contains 28.97 acres of unclassified private lands not in the totals. Acres breakdown: public –75.9 %, private – 24.1 %.

Condition Classes	% of total classified
Potential Natural Community	32.4%
Late Seral	65.5%
Mid Seral	2.1%
Early Seral	0%

Campground Pasture - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	234.14	0	0
Juniper Claypan 16-20"	1.48	0	0	0
Stony Claypan	90.66	0	0	0
Shrubby Loam 16-20"	0	0	1.77	0
Shallow Stony	1.77	425.15	0	0
Mahogany Rockland	0	0.03	0	0
Ephemeral Lakebed	11.68	0	0	0
Totals*	105.59	659.32	1.77	0

*Acres breakdown: public – 93.0%, private – 7.0 %

Condition Classes	% of total classified
Potential Natural Community	13.8%
Late Seral	86.0%
Mid Seral	0.2%
Early Seral	0%

Ben Hall Riparian Pasture - Dry Prairie Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	144.50	0	0
Juniper Claypan 16-20"	20.12	0	0	0
Stony Claypan	49.52	0	0	0
Shrubby Loam 16-20"	0	3.68	24.15	0
Shallow Stony	24.15	231.90	0	0
Dry Meadow	0	0	58.53	0
Totals*	93.79	380.08	82.68	0

*Acres breakdown: public – 92.8%, private – 7.2 %

Condition Classes	% of total classified
Potential Natural Community	16.8%
Late Seral	68.3%
Mid Seral	14.9%
Early Seral	0%

Total Dry Prairie Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	1794.76	0	0
Pine-Mahogany-Fescue	0	306.43	20.39	0
Juniper Claypan 16-20"	1013.56	0	0	0
Stony Claypan	1103.23	0	0	0
South Slopes	0	29.79	0	0
Shrubby Loam 16-20"	0	150.29	74.26	0
Shallow Stony	1054.82	4067.53	0	0
Mahogany Rockland	0	69.19	0	0
Ephemeral Lakebed	621.56	0	0	0
Dry Meadow	0	39.04	123.84	0
Totals*	3793.17	6457.03	218.49	0

*Allotment also contains 71.76 ac. of “Rock” and 28.97 ac. of unclassified private lands not in the totals. Acres breakdown: public - 89.3%, private - 10.7 %

Condition Classes	**% of total classified**
Potential Natural Community	36.2%
Late Seral	61.7%
Mid Seral	2.1%
Early Seral	0%

The ESI information above shows that almost all (98%) of the allotment is in either late seral or PNC condition. As discussed in this Step's section on "Vegetation - Non-Forested Uplands", these seral stages are thought to be at least adequately functional in regards to the major attributes of rangeland health (i.e. soil/site stability, hydrologic function, and integrity of the biotic community) for the ecological sites that dominate this allotment.

The majority of the vegetation classified as mid seral is a Dry Meadow ecological site (silver sagebrush – Nevada bluegrass) near Ben Hall Creek; an area that received very heavy grazing in distantly past years due to the proximity of water. Virtually all of this type is now fenced separately into the Ben Hall Riparian pasture, receives very limited grazing (i.e. 10 days once every three years), and is thought to have strongly upward trends. Similarly impacted, is the small area of Shrubby Loam in mid seral; an area that is also near Ben Hall Creek. This site actually rated compositionally as late seral but was downgraded to mid seral due to below average production. Though this area is outside the Ben Hall Riparian pasture fence, this fencing does positively affect the condition/trend of the adjacent areas by changing the effective water proximity. Utilization studies over the past 10~~9~~ years have shown that the grazing use in this area is consistently slight to light; utilization that is consistent with upward trends.

Other Condition Studies: Key area based condition studies were established and read in 1994 and 1995 at all five of the frequency trend plot locations. This ESI derived condition study allows for an initial quantitative assessment of the current vegetative conditions as well as establishes a baseline for future comparison on a specific key area. This study is designed to be re-read in future years to quantitatively measure vegetation changes indicated by the accompanying trend study reading. On this allotment, all 5 of the studies rated the existing communities between 50-75% similarity to PNC, thus placing the vegetation in the late seral class or "good" condition. As noted above, this condition implies an appropriate plant community that will ensure proper functioning upland conditions and static to upwards trends.

Trend Studies: There are several different types of trend studies on the allotment – photo trend, frequency trend, and observed apparent trend. The photo trend studies are the longest-term range studies in the area having been originally established between 1971 and 1972. There is at least one in each of the major pastures in Dry Prairie - Gerber Lakes, Ben Hall, Dry Prairie, and Miller Creek. As noted in the Dry Prairie Assessment, "*A comparison of the photographs… shows that vegetative conditions have definitely improved since establishment. The photos show that perennial grass, forb, and to some extent shrub, density and vigor has increased. Even more significant is the fact that even with the generally poorer than average growing conditions in the late 80's and early 90's, vegetative conditions, as interpreted from the photo plots, have at worst remained stable and mostly improved*."

The frequency trend studies were established between 1993 and 1996 in each of the above 4 pastures, with an additional one in the Campground pasture. All five have been re-read once since the initial establishment, with the readings indicating that trends in the desired perennial grass species have been static to upward. These overall trends when, considered against the elevated ecological conditions, indicate the appropriateness of current grazing management.

The observed apparent trend was a collateral, qualitative observation made as part of the ESI efforts. All of the inventory vegetation worksheets (26) that pertain to this allotment rated the trend as either static or upward; there was no downward trends noted. Specifically, 8 worksheets had upward trends and 18 static trends. For the 18 static trend sheets, 2 were mid seral, 12 were late seral, and 4 were PNC - all in acceptable or better ecological condition (the mid seral areas were discussed earlier). Late seral and PNC areas are less likely to show upward trends since they are already in an elevated ecological condition and have less "room" to improve.

Utilization Studies: The following is quoted from the Dry Prairie Assessment – "Utilization information has been collected on this allotment since at least 1985. The utilization data from the established points, has shown overall appropriate (moderate or less) average upland utilization - particularly since 1992. The utilization pattern mapping - done every year since 1992 - has also confirmed consistently acceptable overall patterns of use throughout all pastures of this allotment. The light-moderate utilization levels, which are within the KFRA ROD/RMP parameters, indicates long term stability and grazing pressure that is appropriate to maintaining the currently acceptable vegetation conditions. Even though occasional points in occasional years have shown heavy use, there appear to be no chronically overused areas." Utilization levels have been, and continue to be, appropriate for maintaining static to slowly improving ecological conditions.

Other Upland Monitoring/Information: During the ESI survey, Soil Surface Factor (SSF) ratings were made. The following is quoted from the Dry Prairie Assessment regarding SSF – "*As a collateral observation during the ESI, the SSF was estimated for each soils/vegetation site write-up area. Although the field data has not been compiled and input into a data base…(*still true*) a check of all the inventory worksheets and field maps shows that the majority of the allotment (90%+ on an estimated acres weighted basis) is in either the "stable" or "slight" erosion condition classes. These two lowest erosion classes imply generally stable conditions. The limited remaining areas are in the low to mid "moderate" erosion class*."

During the ESI, a qualitative rating of the cryptogamic – or biological soil - crusts was made while collecting other vegetation data. The following allotment specific information on biological crusts is from the Dry Prairie Assessment, "*…The average rating (non-acres weighted) for the Dry Prairie allotment was just under 5.0 - a moderate crust rating. This would be considered neither exceptional nor unacceptable, but adequate, given the limited knowledge of these crusts and the long historical use of the allotment for cattle grazing…*" (See write-up for the Horsefly allotment for more information on biotic crusts; all of which is pertinent to Dry Prairie also.)

Riparian Monitoring: Numerous riparian related monitoring studies have been established/read on this allotment, primarily due to Ben Hall Creek's importance in providing habitat for the federally listed (endangered) shortnose sucker. These studies include long-term riparian photo points, stream bank stability ratings, riparian utilization, stream cross-section and greenline riparian vegetation plots, and proper function condition (PFC) determinations. A complete summary of the riparian monitoring is found in the Dry Prairie Assessment and will not be repeated in this section. Also see the riparian sections of this analysis. However, the analysis of the riparian information in the Dry Prairie Assessment did conclude that riparian/wetland areas in the allotment are either in proper condition or are adequately trending towards the proper resource conditions with current management.

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following conclusions in regards to the 5 Standards for Rangeland Health (explanation statements summarized from Assessment analysis):

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: This standard is being met on the allotment. The overall upward trends and existing high seral state vegetation communities dominated this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: This standard is being met on the allotment. Though Ben Hall Creek has had past riparian problems, grazing management changes made over the last 10-20 years - including upland/riparian pasture fencing and rest-rotation grazing system - have allowed this riparian area to improve significantly with the trends still upwards.

STANDARD 3 - ECOLOGICAL PROCESSES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: This standard is not being met. Although Ben Hall Creek is not on the state list for water quality problems, Miller Creek - which forms the boundary between Dry Prairie and the neighboring Horsefly allotment - does not meet the state standards for summer water temperatures although water quality data indicates water temperature problems and the stream may be added to the 303d list in the future. However, the flows and temperature of Miller Creek are a function of the Gerber Dam and Reservoir over which the BLM has no control. BLM administered livestock grazing is not presently considered a factor in the non-attainment of this Standard.

Since completion of the Assessment, the water temperatures in Ben Hall Creek have been found to exceed Oregon water temperature standards. This stream may be added to the 303(d) list in the future. It should be noted that flows in Ben Hall Creek are controlled by an upstream water rights holder.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate. The Section 7 consultation for the shortnose sucker, over the past 7-8 years, has also affirmed that current grazing management is consistent with maintenance and improvement of aquatic habitat.

The KFRA ROD/RMP listed eight specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Horse Camp Rim Allotment (0886)

Horse Camp Rim is a moderately high priority allotment located within the geographical center of the Gerber Block. This allotment was in non-use for some years during the late 1980’s into the mid 1990’s, at which point the allotment resumed regular use, though at less than the half the permitted use levels. Grazing use is permitted under a 5-pasture, rest-rotation grazing system. Though full grazing use could occur at the permittee’s option, suppressed grazing levels have continued to date - including no use during the 2001 grazing season.

In addition to the recent ESI survey information, this allotment has had an ample amount of monitoring data collected on it over the past 25 years due to its relatively high priority in the resource area. This includes various trend and condition studies, utilization, riparian photo points, and other vegetation information. Since this analysis is the formal Rangeland Health Standards Assessment for this allotment, the monitoring information will be evaluated and summarized here to assist in determining if current grazing management is appropriate.

Ecological Site Inventory: During the 1997 and 1998 field seasons, ecological site inventory (ESI) information was collected for this allotment. That information is summarized as follows:

Plateau Pasture - Horse Camp Allotment - Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	0.47	28.48	0
Pine-Mahogany-Fescue	0	1.12	0	0
Juniper Dry Pine	0	68.39	0	0
Juniper Claypan 16-20"	1280.79	278.20	0	0
Shrubby Loam 12-16"	0	216.62	0	0
Stony Claypan 14-20"	0	373.05	0	0
Claypan 14-20"	3.32	42.41	0.25	0
Ephemeral Lakebed	31.59	0	0	0
South Slopes 14-18"	0	0	121.77	0
Totals*	1315.70	980.26	150.25	0

*Acres breakdown: public – 96.1%, private – 3.9 %

Condition Classes	% of total classified
Potential Natural Community	53.8%
Late Seral	40.1%
Mid Seral	6.1%
Early Seral	0%

Rim Pasture - Horse Camp Allotment - Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	41.9	133.24	0
Pine-Mahogany-Fescue	0	197.92	0	0
Juniper Dry Pine	0	316.32	0	0
Juniper Claypan 16-20"	393.26	225.94	0	0
Shrubby Loam 12-16"	0	0.67	0	0
Stony Claypan 14-20"	0	323.48	0	0
Shallow Stony	0	219.1	0	0
South Slopes 14-18"	0	0	53.27	0
Totals*	393.26	1325.33	186.51	0

*Acres breakdown: public – 99.93%, private – 0.07 %

Condition Classes	% of total classified
Potential Natural Community	20.6%
Late Seral	69.6%
Mid Seral	9.8%
Early Seral	0%

North Spring Pasture - Horse Camp Allotment - Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	1263.94	0	0	0
Stony Claypan 14-20"	276.23	387.99	0	0
Claypan 14-20"	0	72.06	0	0
Claypan Bottom 12-18"	0	92.7	0	0
Shallow Stony	0	240.1	0	0
Irrigated Shallow Stony	0	15.52	0	0
Totals*	1540.17	808.37	0	0

*Does not include the following unclassified riparian: 23.23 acres BLM and 2.3 acres private land. Acres breakdown: public – 98.4%, private – 1.6 %

Condition Classes	% of total classified
Potential Natural Community	65.6%
Late Seral	34.4%
Mid Seral	0%
Early Seral	0%

Midway W.S. Pasture - Horse Camp Allotment - Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	301.72	0	0	0
Stony Claypan 14-20"	0	92.69	0	0
Claypan 14-20"	0	259.1	0	0
Totals*	301.72	351.79	0	0

*Acres breakdown: public – 100%, private – 0 %

Condition Classes	% of total classified
Potential Natural Community	46.2%
Late Seral	53.8%
Mid Seral	0%
Early Seral	0%

Dog Hollow Pasture - Horse Camp Allotment - Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 16-20"	317.25	0	0	0
Stony Claypan 14-20"	571.38	97.46	0	0
Claypan 14-20"	0	0	0.25	0
Claypan Bottom 12-18"	0	0.10	0	0
Shallow Stony	0	468.16	0	0
Dry Meadow	0	0.22	0	0
Irrigated Stony Claypan	0	107.58	0	0
Totals*	996.21	673.52	0.25	0

*Acres breakdown: public – 100%, private – 0 %

Condition Classes	% of total classified
Potential Natural Community	59.7%
Late Seral	40.3%
Mid Seral	<0.1%
Early Seral	0%

Total Horse Camp Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	43.37	161.72	0
Pine-Mahogany-Fescue	0	199.04	0	0
Juniper Dry Pine	0	384.71	0	0
Juniper Claypan 16-20"	3571.73	504.14	0	0
Shrubby Loam 12-16"	0	217.29	0	0
Stony Claypan 14-20"	847.61	1279.21	0	0
Claypan 14-20"	3.32	436.04	0.25	0
Claypan Bottom 12-18"	0	92.80	0	0
Shallow Stony	0	927.36	0	0
Ephemeral Lakebed	59.38	0	0	0
Dry Meadow	0	0.22	0	0
Irrigated Shallow Stony	0	15.52	0	0
Irrigated Stony Claypan	0	107.58	0	0
South Slopes 14-18"	0	0	175.04	0
Totals*	4482.04	4207.28	337.01	0

*Totals include 109.57 acres that are within the ungrazed Twenty One Reservoir Exclosure, but not itemized separately. Totals do not include the following unclassified riparian: 23.23 acres BLM and 2.3 acres private land. Acres breakdown: public - 98.7%, private - 1.3 %

Condition Classes	% of total classified
Potential Natural Community	49.7%
Late Seral	46.6%
Mid Seral	3.7%
Early Seral	0%

With almost 97% of the allotment's vegetation in late seral or PNC, upland functionality is thought to be very high and appropriate for this landscape. The limited grazing use over the past 12-15 years has contributed to the current excellent ecological conditions on the upland areas, as evidenced by the fact that half the allotment is rated PNC. The only potential upland condition issues on this allotment would be the limited mid seral areas, which fall within two ecological sites. First, are the Pine-Sedge-Fescue sites on top of Horse Camp Rim that have received extensive alterations from past timber harvest and under-burning activities. This area actually classified as late seral but was "downgraded" to mid seral due to the disturbance diminishing the understory vegetation production. These type areas typically exhibit upward trends and are thought functionally adequate. Cattle grazing is not a condition issue in these areas.

The other mid seral area is a South Slopes 14-18" ecological site located on the west/southwest facing slopes of Horse Camp Rim (just below the above described site). This area was found to have compositionally late seral vegetation, but was actually rated as mid seral since the abundance of several otherwise highly desirable plants (bitterbrush, Idaho fescue, and Thurber's needlegrass) exceeds that "allowed" in the ecological site description. Part of lowered condition rating is a result of this area not being a discretely clear example of the South Slopes ecological site, i.e. it only loosely fits the South Slope description, but fits it better than the other site choices. (This is not uncommon with any vegetation classification system, since vegetation communities on any landscape are more of a continuum or spectrum than a discretely defined entity.) This area is also experiencing extensive juniper invasion depressing the ecological rating of the site somewhat. Overall, this site is believed functionally adequate, and based on utilization pattern mapping, is being little if at all used by cattle. Thus, cattle grazing is not considered a condition issue in this area.

Other Condition Studies: Key area based condition studies have been established in four of the five pastures in this allotment (Midway Waterspreader (W.S.) doesn't have one due to its small size). The information from these studies is summarized by pasture as follows:

Rim Pasture: This study was originally established in 1998 and was found to be 68.2% similar to potential, or late seral. It is not scheduled for re-reading until at least 2008.

Plateau Pasture: This study was established in 1997 and was found to be 77.6% similar to potential, or PNC. It is not scheduled for re-reading until at least 2007.

Dog Hollow W.S.: This study was established in 1998 and found to be 51.7% similar to potential, or late seral. The reason for the relatively low rating was an overabundance of native forbs (41.1% of the measured vegetation) – primarily pussytoes (*Antennaria* sp.), biscuit-root (*Lomatium* sp.), buckwheat (*Eriogonum* sp.), and phlox (*Phlox* sp.). Though these are all native species, some are often considered indicators of past overgrazing - particularly phlox and possibly pussytoes. However, all are native perennials species that contribute to overall functionality by binding the soil with their roots and providing ground cover and litter production.

North Springs Pasture: There are two condition studies in this pasture. HCR-5 is located in the north end of the pasture and was established in 1998. It was found to be 73.4% similar to potential, or in the upper end of late seral – almost PNC. It is not scheduled for re-reading until at least 2008. HCR-6 was informally established in 1983 and relocated in 1998 as close as possible. It is located on the extreme western side of the pasture and was determined in 1998 to be 75.8% similar to potential, or PNC. The 1983 rating was 56% of potential. This strongly implies that in the intervening 15 years, conditions have improved significantly.

Overall, these key area specific condition studies support the conclusion, noted in the ESI section above, that ecological conditions are good to excellent and the uplands have at least adequate functionality. Currently permitted grazing use appears to be sustainable and appropriate.

<u>Trend Studies</u>: Like most of the higher priority allotments in the Gerber Block, Horse Camp Rim has several different trend studies – photo trend, frequency trend, and observed apparent trend from the ESI survey. Due to this allotment's moderate priority status, the frequency trend studies were not established until the late 1990's. They have not as yet received a second reading that allows for any comparison; thus, these studies will not be discussed further.

Rim Pasture: Photo point HCR-1 was originally established in 1970 making it one of the older trend studies in the Gerber block. It shows that conditions have been stable (static trend) to slightly upwards (i.e. slight increase in oatgrass) – a trend consistent with the elevated ecological conditions.

Plateau Pasture: Photo point HCR-2 was also established in 1970. It shows a distinct upward trend as evidenced by an increase in the number and vigor of the Idaho fescue within the plot - including the total replacement of the one low sagebrush bush with a large fescue clump. The view pictures show a steady and significant increase of large, vigorous fescue bunchgrasses throughout this low sagebrush area.

Midway W. S. Pasture: Photo point HCR-3 was also established in 1970 in an area that was seeded with several pasture grass species (meadow foxtail and a wheatgrass) and intermittently irrigated during the summer. Since about 1975 the water spreader has been dysfunctional and the area cannot be irrigated. This caused a loss of the seeded pasture grass species and a return to a more native quality, with much less grass production due to less water. This gives the sequence of photos the appearance that the trend is downwards when in fact it is just returning to a more typical native vegetation community. Trend would really be considered static to mildly upward based on field observations and the fact that as shown in the ESI tables above, this pasture is 100% late seral/PNC and is not believed to have any condition problems.

Dog Hollow W. S. Pasture: This pasture has no photo trend study; the frequency plot established in 1998 will provide for long-term trend observations.

North Spring Pasture: Photo point HCR-6 was established in 1974. It shows a slow upward trend in condition based on an increase in perennial grasses and forbs. Of interest with these photos is that the area appears to have fluctuated in condition over time as judged by the aspect of the perennial grasses. Specifically, the earliest (mid 70's) photos look relatively poor, the late 70's look better, the mid 80's looking a bit poorer again, then looking good again through the 90's. However, this could simply be a function of yearly production or grazing pressure prior to the photo re-taking.

Utilization Studies: Utilization – use points and pattern mapping – has been done periodically since the mid-1980's. The utilization points read during the 1980's (1985-1989), when more or less full grazing use was being made, averaged in the moderate range though varied widely. The use was generally highest (sometimes heavy) in the two water spreaders, diminishing in the other native pastures with the lowest average levels in the Rim pasture. Since grazing regularly commenced again in the mid-90's, the use (where apparent) has been consistently slight to light (10-40%), with the overall average slight (<15%). These utilization levels are consistent with the grazing being about one-half of that which could be licensed. Based on these utilization observations, the upland vegetation communities would likely be properly utilized (i.e. no more than moderate average use) and vegetation conditions stay good to excellent at full permitted use, as long as the rest-rotation system was properly followed. Light to moderate utilization levels are within the KFRA ROD/RMP parameters and indicate long-term stability and a grazing pressure that is appropriate to maintaining the good vegetation conditions.

Other Upland Monitoring/Information: During the ESI, several other observations were made relative to resource conditions. One observation was the Soil Surface Factor (SSF), which is a qualitative expression of current soil erosion activity. For this allotment, 23 different vegetation write-up sheets were prepared. 5 write-ups indicated stable conditions, 11 slight erosion activity, and 7 rated as moderate erosion activity. However, even this limited erosion activity is somewhat overstated due to the natural inclination of the perennial bunchgrasses to form pedestals in the area's high clay soils. Pedestaling – natural or otherwise – is a downgrading element of the SSF rating system. Overall, these observations though qualitative in nature, nonetheless indicate that erosion is a limited concern on this allotment.

Another observation from the ESI is the Observed Apparent Trend (OAT) rating, which is a qualitative estimation of trend based on a visual assessment of key resource attributes (e.g. plant vigor, litter, gullies). Of the 23 vegetation write-ups completed, 12 indicated upward trends and 11 were estimated to have stable trends; none indicated downward trends. The OAT estimates support the previous discussions and conclusions on trend and condition.

The last of the ESI collateral observations was a qualitative rating of the cryptogamic (biological soil) crusts. The importance of these crusts and a description of the rating system was explained in the Horsefly allotment section – see for more information. The average of the vegetation write-up sheets for Horse Camp Rim was just over 4 on a scale from 0 to 10. This would be considered adequate – neither exceptional nor unacceptable - given the limited knowledge of the ecology and significance of these crusts in this area.

Riparian Monitoring:
The Horse Camp Rim allotment has a portion of one relatively important riparian/drainage area – Antelope Creek. In this allotment, the creek lies entirely within the North Spring pasture. This drainage is largely intermittent/seasonal in this allotment, except for a short spring augmented stretch in the middle of this pasture (which is partially private) and an assortment of "holes" that will often contain water throughout the year in above average precipitation years. Nine riparian photo points were established (AC-1 through AC-9), along the portions of the drainage in this pasture, in 1990 with the photos re-taken 5 times since establishment. The purpose of these points is to visually track the vegetation changes that may be taking place within the drainage. A review of these photographs reveals that 8 of the 9 photo points have experienced little change in actual condition (i.e. increase/decrease in the apparent extent or composition of

the riparian vegetation communities) but instead only show relative biomass differences between years that were grazed or ungrazed prior to the photo. The one exception is at photo point AC-1, which is located at the road crossing on this drainage in the extreme north end of the North Spring pasture. This point seems to show a slight downward trend in that the riparian herbaceous species are less dense and less spatially distributed. This trend is a function of the road itself, which fords the drainage right through the photo point, an artificial stock-watering dugout in the drainage just below the road, and to some degree the long-term grazing use.

In July of 1996, the drainage was evaluated for Proper Function Condition (PFC). It was stratified into three different reaches with three different ratings assigned. The determinations and supporting rationales, from the PFC checklist sheet, are as follows:

<u>AC-1 to between AC-2 & AC-3</u>: This reach was judged to be "Functional - at Risk" with the trend "Not Apparent" (with the statement "*Depends on grazing and precipitation*"). The checklist had ample comments on it about the conditions observed, some of which follow:

"-Sinuosity is good but there's still lateral cutting. Is vertically stable in most areas because it's hit the rock bottom.
-Cattle grazing above this stretch of the creek as well as along the creek is contributing to erosion, mainly by hoof action in and along side the creek bed. Note: Many areas are extremely rocky so they are stable even though they don't support much riparian vegetation.
-Not much riparian vegetation diversity. Little sedge diversity or mesic grasses & little or no willows. There are ponderosa pine & juniper to provide large woody debris.
-It's an intermittent creek that at this time only has widely spaced pools of water which are drawing livestock & wildlife use. There's areas that are suffering erosion, both with and without riparian vegetation. Many of the riparian plants present are not strong stabilizers."

<u>Between AC-2 & AC-3 through AC-7</u>: This stretch, which makes up the majority of the Antelope drainage within the pasture, was rated as "Proper Functioning Condition", with the trend noted as "Not Apparent" (with the statement "*Cattle grazing may put this at risk with repeated use*"). Some of the remarks for the stretch of the drainage are as follows:
"-There is greater diversity in mesic grass, sedge & willows from below North Spring.
-Area below pt. #5 is private, not sure where boundary is. Some of the meadow is on BLM.
-Area around (and just below) pt. #5 is exceptionally nice (spring w/meadow) w/willows (some trees!), and more diverse riparian species (i.e. Nebraska sedge, long beaked sedge, wooly sedge, cat tails). This area has received a lot of use & trampling. This use on an annual basis may degrade this exceptionally nice, springy, meadow.
-We have few nice meadows like this on the east side. Maybe we should consider preserving this area (though see note (about private land)).

About ¼ mile of this drainage section is on private land, with the rest BLM administered. There is also a shallow drainage that comes into Antelope from the west in about the middle of the private 40-acre parcel (between photo points AC-5 & AC-6). This drainage way now functions as the overflow from the ditch that runs between the Dog Hollow and Bumpheads Reservoirs. In high runoff years, this channel contributes some water to Antelope Creek, though in most years it is probably minimal. During a field check made during May 2001, there was no evidence of any runoff, though this was following a very dry winter/spring."

<u>AC-8 & AC-9</u>: This final portion of the drainage (in this allotment) was rated as "Nonfunctional" with the trend "Not Apparent". Remarks were as follows:

> *"-Some rock check dams have been built to try and dissipate energy.*
> *-Tall raw stream banks."*

The above comments apparently pertain to AC-9 based on a review of the photo point pictures. AC-9 does have a distinct cut bank and a large rock check dam, which was installed in late 1992 or early 1993. Conditions in this area have not significantly changed and the effect of the rock check dam – positive or negative – is not known. AC-8 is a rocky, basalt boulder dominated “flat” with no defined channel. It is not know if this latter area has the ability to change significantly in the foreseeable future, even with total exclusion from grazing pressure.

Of the 2.3 miles of the Antelope drainage in this allotment, approximately 1.5 miles is “Proper Functioning Condition”, 0.3 mile is “Functional – At Risk”, and 0.5 mile is “Nonfunctional”. Evaluating the PFC ratings, in conjunction with the 10-year span of photo points, does raise some concerns about the long-term condition of portions of this drainage (the upper and lower stretches) and the speed at which recovery is or should be occurring. It is not known what the drainage looked like decades ago when grazing pressure was much higher, though it is thought that recovery has been significant, albeit slow. This is consistent with the nature of this arid area with 14-16" average precipitation. (See *Step 6* - *Recommendations* for more information.)

In summary, the allotment specific information and analysis in this document leads to the following conclusions in regards to the 5 Standards for Rangeland Health:

<u>STANDARD 1 - WATERSHED FUNCTION - UPLANDS</u> - This standard is being met on the allotment. The overall upward trends and existing high seral state vegetation communities dominated this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

<u>STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS</u> - This standard is either met or substantial progress towards meeting it is being made. Though the Antelope Creek drainage is not all in PFC, it is thought that the trend is upwards, albeit slowly. The current rest-rotation grazing management system, which was originally implemented in the 1980’s and re-established in 1996, is probably allowing this riparian area to improve significantly with the trends still upwards.

<u>STANDARD 3 - ECOLOGICAL PROCESSES</u> - This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

<u>STANDARD 4 - WATER QUALITY</u> - This standard is not met, but substantial progress towards meeting it is being made. Although there are no 303(d) listed waters within this allotment, the lower portion of Antelope Creek is included on the 303(d) list for water temperature. See Standard 2 for an explanation as riparian conditions are integrally linked to water quality. As riparian conditions improve (due to management recommended or affirmed in Step 6) the BLM land related impacts will be reduced and progress will made towards meeting this Standard.

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES</u> - This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate.

The KFRA ROD/RMP listed four specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Pitchlog Allotment (0887)

The Pitchlog allotment is one of the larger and most important grazing allotments in the KFRA and has been classified as the KFRA's #1 "I" category allotment since completion of the RMP. This allotment has had extensive amounts of rangeland monitoring studies established and read on it over the past 30 years, particularly during the past 8 years due to the Section 7 consultation requirements. These include various condition and trend studies, utilization, and a mix of riparian related studies, in addition to the ESI survey. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999 and found that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for maintaining the current overall good vegetation conditions. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized as necessary in the following narrative. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health. Some additional monitoring information has also been collected since completion of the Assessment and will be discussed.

Ecological Site Inventory: Since Assessment completion, the ESI vegetation information has been refined so that a very accurate figure is available - by pasture - for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres by pasture has also been calculated to a more accurate level. That information is summarized as follows:

SW Pasture – Pitchlog Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	55.35	1444.05	0
Pine-Mahogany-Fescue	29.84	629.81	0	0
Juniper Dry Pine	0	282.80	0	0
Juniper Claypan 16-20"	248.77	433.64	0	0
Shrubby Loam 12-16"	0	0.35	0	0
Stony Claypan 14-20"	77.13	310.32	0	0
Shallow Stony 10-20"	54.04	477.89	0	0
Ephemeral Lakebed	27.93	0	0	0
Dry Meadow	0	0	0	0
Mahogany Rockland	0	49.38	0	0
Totals*	437.71	2239.54	1444.05	0

*There are also 24.62 acres of defined BLM rock outcrops, 23.04 acres of unclassified BLM riparian, and 47+ acres of water - all not included in totals above. Acres breakdown: public – 96.3%, private – 3.9 %

Condition Classes	% of total classified
Potential Natural Community	10.6%
Late Seral	54.4%
Mid Seral	35.0%
Early Seral	0%

SE Pasture – Pitchlog Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	618.46	0	0
Stony Claypan 14-20"	0	643.39	0	0
Shallow Stony 10-20"	0	789.89	0	0
Dry Meadow	0	0	2.46	0
Totals*	0	2051.74	2.46	0

*There is also 3.36 acres of unclassified BLM riparian and 72.53 acres of unclassified private - all not included in totals above. Acres breakdown: public –87.4 %, private – 12.6 %

Condition Classes	% of total classified
Potential Natural Community	0%
Late Seral	99.9%
Mid Seral	0.1%
Early Seral	0%

NE Pasture – Pitchlog Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	935.82	168.92	0
Juniper Claypan 16-20"	171.71	0	0	0
Stony Claypan 14-20"	4.14	279.18	0	0
Shallow Stony 10-20"	0	606.7	0	0
Ephemeral Lakebed	0	24.90	0	0
Dry Meadow	0	35.54	36.12	0
Totals*	175.85	1882.14	205.04	0

*There are also 68.2 acres of unclassified BLM riparian and 17.04 acres of unclassified private riparian - all not included in totals above. Acres breakdown: public – 82.7%, private – 17.3 %

Condition Classes	% of total classified
Potential Natural Community	7.7%
Late Seral	83.2%
Mid Seral	9.1%
Early Seral	0%

NW Pasture – Pitchlog Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	0	78.96	0
Pine-Mahogany-Fescue	358.95	0	0	0
Juniper Claypan 16-20"	65.78	319.59	0	0
Stony Claypan 14-20"	67.08	450.01	0	0
Shallow Stony 10-20"	0	399.62	0	0
Totals*	491.81	1169.22	78.96	0

*Acres breakdown: public – 90.8%, private – 9.2 %

Condition Classes	% of total classified
Potential Natural Community	28.3%
Late Seral	67.2%
Mid Seral	4.5%
Early Seral	0%

Total Pitchlog Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	1609.63	1693.93	0
Pine-Mahogany-Fescue	388.79	629.81	0	0
Juniper Dry Pine	0	282.80	0	0
Juniper Claypan 16-20"	486.26	434.12	0	0
Shrubby Loam 12-16"	0	0.35	0	0
Stony Claypan 14-20"	148.17	1682.90	0	0
Shallow Stony 10-20"	54.04	2274.10	0	0
Ephemeral Lakebed	27.93	24.90	0	0
Dry Meadow	0	35.54	38.58	0
Mahogany Rockland	0	49.38	0	0
Totals*	1105.19	7023.53	1731.51	0

*There is also 24.62 acres of defined rock outcrops, 72.53 acres of unclassified private, and 94.60 acres of unclassified BLM riparian & 17.04 acres of unclassified private riparian - all not included in totals above. Acres breakdown: public - 90.0%, private - 10.0 %

Condition Classes	% of total classified
Potential Natural Community	11.2%
Late Seral	71.2%
Mid Seral	17.6%
Early Seral	0%

The ESI information above shows that 82% of the allotment is in either the late-seral or PNC condition classes. As discussed in this Step's section on "Vegetation – Non-Forested Uplands", these seral stages are thought to be at least adequately functional in regards to the major attributes of rangeland health (i.e. soil/site stability, hydrologic function, and integrity of the biotic community) for the ecological sites that dominate this allotment.

The mid-seral areas (Pine-Sedge-Fescue sites, which comprise 98% of the mid-seral vegetation) were addressed by the 1999 Assessment as follows: *"Almost all of the mid seral areas were in the pine-sedge ecological sites; areas which have been substantially impacted by past timber and fire management activities. Many of these pine-sedge sites actually rated numerically in the Late Seral condition class, but were "downgraded" to mid seral due to low production - a direct effect of the recent burning on the shrub component. However, this under-burning has also reduced the duff layer underneath the trees, allowing for a resurgence of the herbaceous community. All of this regeneration is occurring incrementally and the trend in most pine areas is definitely upwards. As a general statement about conditions within the allotment, it can be said that the more a site has pine potential, the more likely it is to have been disturbed and in a temporarily depressed condition state."*

The following was also noted in the Assessment about the juniper increases and densities: *"One very significant ESI observation is that most ecological sites in the Gerber area have been and are continuing to experience increased densities of western juniper. These increases are probably primarily due to the combined effects of fire suppression, historic livestock grazing, and possibly past timber harvest activities. The juniper increase has the future potential to dramatically effect ecological conditions more than it already has. This could include decreased forage production for wildlife and livestock, increased erosion potential due to diminished ground cover, mono-culture vegetation types that decrease wildlife diversity, decreased water availability, and other impacts. These observations are summarized as follows:*

- The spaces between the older junipers (150-1000+ years old) in the "old" juniper sites (Juniper Claypan 16-20") are being slowly filled in with much younger trees - way beyond what would be needed for replacement of the older trees as they die off (very slow!).

- The shallow soil, non-juniper sites (Stony Claypan 14-20", Shallow Stony 10-20") are all experiencing varying increases in juniper, with the juniper generally increasing proportionally as soil depth increases. However, some of these areas are also seasonally (winter/spring) saturated - particularly the Shallow Stony 10-20" - which appears to suppress the juniper encroachment.

- Most of the other, deeper soil and non-pine ecological sites, that should have juniper as a minor late seral/PNC component, are experiencing increases in juniper density. On the Pitchlog allotment there is only one of these ecological sites in any abundance: Mahogany Rockland 10-20". Of particularly concern is the fact that in some of these sites the mountain mahogany component is collapsing due to the juniper competition. These areas are probably some of the most important to consider for juniper reduction activities, as they would have the highest beneficial results to wildlife.

- The ponderosa pine areas (Pine-Mahogany-Fescue 16-20" and Pine-Sedge-Fescue sites) are also experiencing dramatic increases in juniper. This competition is placing pressure on the pine component of the community and is also causing the same problems with mountain mahogany as noted above."

The very small amount of mid-seral, Dry Meadow vegetation noted in the NE pasture is a mixture of private and public land near the upper (BLM) portion of the Pitch Log drainage. It is a poorly differentiated site, i.e. it is a jumble of various phases of several ecological sites. It appears that the area may have been a more continuous silver sagebrush/Nevada bluegrass community that has suffered the effects of past, heavy grazing use and the deep incising of the drainage channel. These impacts have lowered the areas vegetation response and improvement potential and subsequent shifting of the vegetation community's composition.

<u>Other Condition Studies</u>: Key area based condition studies were established and read in 1994 and 1995 at all four of the frequency trend plot locations. This ESI derived condition study allows for an initial quantitative assessment of the current vegetative conditions as well as establishes a baseline for future comparison on a specific key area. These studies allow for future, specific quantification of vegetation changes indicated by the accompanying trend study reading and will only be re-read if the trend study shows that significant change has occurred. The initial readings on all four studies rated the existing communities between 50-75% similarity to PNC, thus placing the vegetation in the late seral condition class or "good" condition. As noted above, this condition implies an appropriate plant community that will ensure proper functioning upland conditions and static to upwards trends.

<u>Trend Studies</u>: There are several different types of trend studies on the allotment – photo trend, frequency trend, and observed apparent trend. The photo trend studies are the longest-term range studies in the area having been originally established between 1971 and 1972. The following is quoted from the Pitchlog Assessment: "*There is at least one long term Photo Trend study located in each of the 4 pastures in Pitchlog which were originally established between 1972 and 1974. A comparison of the photographs - albeit a subjective comparison - shows that vegetative conditions have definitely improved since establishment. The photos show that perennial grass density and vigor has increased. Even more significant is the fact that even with the generally poorer than average growing conditions in the late 80's and early 90's, vegetative conditions, as interpreted from the photo plots, have at worst remained stable and mostly improved."*

The frequency trend studies were established in 1993 and 1994 in each of the 4 allotment pastures. All four have been re-read once since establishment; three of them since the Assessment was completed in 1999 (they were read later in 1999). A summary of all four studies follows:

Southeast Pasture: This study was re-read in 1998 and was discussed in the Assessment, as follows: "(The southeast pasture's) frequency trend plot was re-read in 1998. The information shows that two of the dominant native perennial grasses (Sandberg's bluegrass and Idaho fescue) have significantly increased and one early successional dominant native grass (bottlebrush squirreltail) decreased significantly - apparently displaced/replaced by the other two grasses, which are late successional dominant. This is a solid indicator of upward rangeland ecological trend."

Southwest Pasture: This study showed that overall conditions have remained static to slightly upward. Squirreltail and Sandberg's bluegrass both showed statistically significant increases in frequency, with Idaho fescue and single-spike oatgrass remaining the same.

Northwest Pasture: This study showed that overall conditions have remained static to slightly upward. Sandberg's bluegrass increased significantly; the other three perennial grasses (same as SW pasture above) remained static.

Northeast Pasture: This study showed that overall conditions have remained static on all important perennial grass species.

As noted previously, the observed apparent trend was a collateral, qualitative observation made as part of the ESI efforts. All of the inventory vegetation worksheets (34) that pertain to this allotment rated the trend as either static or upward; there was no downward trends noted. Specifically, 21 worksheets estimated upward trends and 13 static trends. For the 13 static trend areas, 1 was rated as mid seral, 9 were late seral, and 3 were PNC - all in acceptable or better ecological condition (the mid seral area was discussed earlier). Late seral and PNC areas are less likely to show upward trends since they are already in an elevated ecological condition and have less "room" to improve. Overall, all the different trend studies show that the allotment's upland vegetation conditions are in excellent condition with static to upwards trends. Static trend is entirely appropriate for these vegetation communities, which are already in upper late seral to PNC condition.

<u>Utilization Studies</u>: Utilization has been periodically read on this allotment since the mid-1980's, with use pattern mapping done frequently since the early 1990's. To quote the Pitchlog Assessment – "*The utilization data, from the established points, has shown consistently moderate or less utilization since full implementation of the 4 pasture rotation system in the early 90's. The utilization pattern mapping - done every year since 1992 - has also shown consistently acceptable patterns of use throughout the allotment. The light-moderate utilization levels, which are within the KFRA ROD/RMP parameters, imply long term stability and grazing pressure that is appropriate to the conditions of the landscape."* Utilization read since the Assessment (formally in 2000 and 2002, and informally in 2001) showed some small areas of moderate/ heavy use in the vicinity of Pitchlog Creek (NE pasture), though it is primarily on the interspersed private lands. (Note: the NE pasture was rested in 2002 and received essentially no livestock use.) In occasional years, the Wild Horse drainage (SW pasture) has received more than desired use in some small areas. Both 2000 and 2001 have had dry (2000) to very dry (2001) growing spring conditions that have limited growth and resulted in proportionally increased utilization percentages. Annual precipitation in 2002 was about average and resulted in proper utilization levels. Overall the use in these areas is appropriate, although the current high levels of monitoring attention to observe long-term dynamic between vegetation trends/ conditions and livestock utilization levels is warranted. The positive benefits of the rest-rotation system should ameliorate the effects of the occasionally heavier than desired use.

<u>Other Upland Monitoring</u>: During the ESI, several other observations were made relative to resource conditions. One observation was the Soil Surface Factor (SSF), which is a qualitative expression of current soil erosion activity. For this allotment, 33 different vegetation write-up sheets were prepared. 10 write-ups indicated stable conditions, 19 slight erosion activity, and 4 rated as moderate erosion activity. As noted earlier, even this limited erosion activity is somewhat overstated due to the natural inclination of the perennial bunchgrasses to form pedestals in the area's high clay soils. Overall, these observations though qualitative in nature, nonetheless indicate that erosion is a limited concern on this allotment's uplands.

The last of the ESI collateral observations was a qualitative rating of the cryptogamic (biological soil) crusts. (A description of the rating system was explained in the Horsefly allotment section – see for more information.) The average of the vegetation write-up sheets for the Pitchlog allotment was 4.4 on a scale from 0 to 10. If the spike-rush and pine sites are not considered – these being ecological sites of limited crust potential – the overall rating goes up to 5.2. This would make this area one of the better rated areas in the Gerber Block. Given the limited knowledge of the ecology and significance of these crusts in this area we can not make any particular conclusions about this, except that it is considered a good level of biological crusts.

Riparian Monitoring: Numerous riparian related monitoring studies have been established/read on this allotment, primarily due to Barnes Valley Creek's – and to a lesser degree, Pitch Log Creek's - importance in providing habitat for the federally listed (endangered) shortnose sucker. These studies include long-term riparian photo points, stream bank stability ratings, riparian utilization, stream cross-section and greenline riparian vegetation plots, and proper function condition (PFC) determinations. A complete summary of the riparian monitoring is found in the Pitchlog Assessment and will not be repeated here. (Also see the riparian sections of this analysis.) However, the analysis of the riparian information in the Pitchlog Assessment did conclude that riparian/wetland areas in the allotment are either in proper condition or are adequately trending towards the proper resource conditions with current management, with one possible exception. There have been some concerns that the Pitchlog drainage may not be improving as much and/or as fast as it could or should. The ongoing array of monitoring studies should help answer these resource questions over time.

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following conclusions in regards to the 5 Standards for Rangeland Health (the actual explanation statements below are summarized from the Assessment analysis):

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: This standard is being met on the allotment. The overall upward trends and existing high seral state vegetation communities dominated this allotment strongly indicate proper functioning upland conditions. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: This standard is believed to be substantially met on the allotment. Though some problem areas still exist on the allotment, as noted above, the current grazing management is believed to be making "significant progress" towards the eventual, full meeting of this Standard. Intensive monitoring studies will continue to be read on the drainages in this allotment and will be used to help refine management, as needed, over time.

STANDARD 3 - ECOLOGICAL PROCESSES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: This standard is not being met on the allotment. The following is quoted from the Assessment – "Barnes Valley Creek does not meet the state standards for summer water temperatures. However, the livestock grazing on the Pitchlog allotment is not presently considered a significant factor in the non-attainment of this Standard. Because of changes in grazing management in recent years (noted in the current management section later), the current livestock use is believed to be making as much progress as possible towards meeting this standard. In addition, BLM grazing management is meeting the USFWS Biological Opinion requirements for the areas around both creeks, as it pertains to appropriate habitat for the endangered shortnose sucker. Another factor is that large portions of the creek above and to the northeast of the BLM administered lands, are privately owned or Forest Service administered, and the use of these lands is beyond BLM control." As noted previously, the conditions along the Pitch Log drainage still leave something to be desired, though it is not a 303(d) listed stream. Ongoing monitoring studies will assist in determining if further management change is needed or would help downstream water quality concerns.

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: This standard is being met on the allotment. The high seral state vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate. For the past 8 years, the Section 7 consultation for the shortnose sucker has affirmed that current grazing management is consistent with maintenance and improvement of aquatic habitat.

The KFRA ROD/RMP listed seven specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Rock Creek Allotment (0888)

The Rock Creek allotment is located in the southeast corner of the Gerber Block of Bureau of Land Management (BLM) administered lands in southern Klamath County. There are approximately 2750 acres of public land and 1200 acres of private land within the allotment boundaries (see the attached map). The current livestock grazing preference is for 216 AUMs of cattle use with a season-of-use from May 1 to June 20. The current leaseholder is Grohs Ranch.

The allotment grazing use is managed in accordance with the Warm Springs Coordinated Resources Management Plan (CRMP). This is a cooperatively developed plan involving Grohs Ranch, the BLM, the Modoc National Forest, and the Fremont National Forest. The plan calls for grazing of the BLM Rock Creek allotment by 150 pairs of cattle from May 1 to May 31. The allotment is rested every fourth year. This CRMP schedule results in actual livestock use of the allotment of 150 AUMs every three out of four years.

The allotment is currently a "C" category for management and monitoring purposes. Prior to 1995 and the completion of the Resource Management Plan for the resource area, this allotment was considered an "I" category. The plan changed it to a "C" category. The "I" category allotments are monitored more intensively and more often than C category allotments. Thus, there are established monitoring studies for the Rock Creek allotment, but since 1995 they have been read on a less frequent basis

An Ecological Site Inventory (ESI) was completed during 1997-98 that included the Rock Creek allotment. The information from this inventory and from the various monitoring studies as well as input from various BLM resource specialists will be used in determining the attainment of the Standards for Rangeland Health.

Ecological Site Inventory: The following table is a summary of the different ecological sites within the Rock Creek allotment and their condition classes by acres.

Rock Creek Allotment – Total Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	48.55	1050.0	0
Juniper Dry Pine	0	1116.65	0	0
Juniper Claypan 16-20"	263.20	537.22	0	0
Juniper Claypan 12-16"	0	24.35	0	0
Stony Claypan 14-20"	12.2	0	0	0
Shallow Stony 10-20"	0	278.31	0	0
Ephemeral Lakebed	259.08	0	0	0
Dry Meadow	0	86.32	0	0
Totals*	534.48	2091.40	1050.0	0

*Allotment also contains 62.97 acres of unclassified private lands, which are not included in the totals. Acres breakdown: public - 67.2%, private - 32.8 %

Condition Classes	**% of total classified**
Potential Natural Community	14.5%
Late Seral	56.9%
Mid Seral	28.6%
Early Seral	0%

This table shows that approximately 71% of the allotment has vegetation conditions that are classified as late seral or potential natural community. About 60% of the allotment consists of pine or pine/juniper-dominated ecological sites. The Pine-Sedge-Fescue sites were the only ones rated in the mid seral class. A review of the field worksheets from the survey show that most of these pine areas had been recently underburned. After these underburns the perennial grass and shrub species can be slow to return and this was reflected in the worksheets. The recorded total production was low and climax species made up a smaller percentage of the total vegetation at these sites.

Ecological sites with juniper trees as their major overstory component comprise about 22% of the allotment. This increases to 53% if the Juniper Dry Pine sites are included in this group. These sites typically have a nearly equal level of junipers and pines. Either way, these sites were all rated as being in late seral or PNC conditions.

Sites dominated by low sagebrush and perennial grass species comprise about 8% of the allotment. These are the Stony Claypan and Shallow Stony sites. These areas were also rated as being in late seral or PNC condition.

The other two ecological sites in the allotment are the Ephemeral Lakebed and Dry Meadow. They comprise about 9% of the allotment. These are both located at the edges of reservoirs where the water level recedes in the summer. The Ephemeral Lakebed was rated as PNC and the Dry Meadow was rated as late seral.

The ESI also looks at soil erosion factors using condition classes. A review of the field sheets showed that all the sites were rated as stable or slight with one site rated as moderate. These ratings indicate that soil loss is not a current problem on the allotment. The upland soils are well protected from rainfall and overland flow by vegetation, litter, and/or stones and gravel. With over half of the allotment in pine or pine/juniper-dominated ecological sites, there is a substantial amount of litter protecting the soils and a tree canopy intercepting rainfall.

Upland Monitoring Studies

Utilization Points: Utilization Point monitoring has been done on the allotment since 1984. There are ten utilization points that have been read, eight of these are on the BLM and two are on private. Points 1 and 2 are located within the riparian area along Rock Creek. Points 3 through 7 are at upland locations. The two points on the private lands are not shown in this table as these areas have not been read on a consistent basis and the grazing season has been largely independent of the BLM grazing permit. The following table shows the readings that have been done at the points on the BLM lands.

Utilization Points

Year	# 1	# 2	# 3	# 4	# 5	# 6a	# 6b	# 7
2000	30%	28%		38%	38%	40%	20%	40%
1995	56%	48%		16%	9%	11%	31%	54%
1991	75%	70%	13%	42%	31%	44%	68%	22%
1990	38%	29%	30%	23%	18%	28%		
1988	58%	64%	3%	11%	52%	46%		18%
1987	68%	68%	36%	44%	46%	56%		62%
1986	58%	56%	52%	48%	42%	58%		50%
1984	40%	34%	46%	34%	38%	42%		36%
Average	53%	50%	30%	32%	34%	41%	40%	40%

The data from this table shows that average utilization on the upland areas of the allotment (points 3-7) has been within the guidelines for allowable use as designated in the RMP (50% or less). The years when the allotment was rested are not figured into the average. This would lower the average considerably.

Utilization standards for riparian areas are based upon their Proper Functioning Condition status. Point 1 is within a section that is considered to be in Proper Functioning Condition where the utilization standards allow for use on the herbaceous vegetation of 50% or less. Point 2 is within an area that is considered to be in Nonfunctioning condition. Allowable utilization in this section would be 0-40%. These utilization levels were exceeded at both points during five of the eight years that were monitored.

A review of the utilization monitoring forms shows that monitoring occurred within a month of the livestock being moved from the allotment during most years. The exceptions to this were the years 1995 and 2000. With utilization monitoring, the current year's growth needs to be used as the baseline. Monitoring in June right after the livestock were removed does not account for any plant growth after that point. The upland areas normally experience additional growth into July with a fall re-growth period that is dependent on fall precipitation. The riparian areas typically continue growing through the summer and into the fall due to the presence of surface and subsurface moisture. So in order to get a good reading of the current years growth, utilization monitoring should be done in the fall. The figures in the table above may reflect utilization level readings that are higher than fall readings would reflect, especially in riparian areas. The readings from 1995 and 2000 are probably a more accurate reflection of the utilization that is occurring.

Use Pattern Mapping: Along with the utilization point monitoring, use pattern mapping of the allotment was completed during 1995 and 2000. The 1995 map and accompanying narrative give a good overview of the patterns of use in the allotment. As expected, the cattle tend to move from water source to water source with slight to light use levels on the upland areas and light to moderate with occasional heavy use in the areas near the water.

During 2000, utilization was mainly light throughout the allotment. There were some moderate use areas around two stock ponds in Section 19 and at Adobe Spring. Some cattle did make use in the riparian area above the Stateline road in the fall due to poor fence conditions between the private and BLM lands. The mapping was completed in mid-October and good re-growth of the perennial grasses was noted.

Actual Use: Actual use data for this allotment has been reported for only two of the years that utilization data was collected, 1988 and 1991. (Note: Actual use is only required on "I" category allotments; thus the lack of information for Rock Creek.) The scheduled use for the allotment has been fairly consistent. From 1984 through 1993, licensed use was for 120-125 pairs with a 30-day season of use. The starting date was usually May 1 but was pushed back to May 15 and May 21 for a couple of years. During 1985, 1989, 1994, and 2001 the allotment was rested. Starting in 1995, the licensed numbers were increased to 150 pairs with the same 30-day use period. No reason for this change was documented other than a request from the permittee to increase the numbers. The licensed use has remained at 150 pairs and has been reiterated in the annual plan of operations for the CRMP. This level of use, 150 AUMs, is still less than the full permitted use for the allotment, which is 216 AUMs.

Photo Trend: There are two upland photo trend plots that have been monitored since 1971, RC-1 and RC-2. Logging activities in 1979 impacted the RC-2 photo plot location. The close-up photo location became useless and the general view photo was not re-photographed again until 1997.

RC-1 is located about ½ mile west of Rock Creek in an open area within a Juniper Dry Pine ecological site. On this plot, trend data sheets were completed up until 1982. After that point, only photos were taken. From the data sheets, it appears that the two key grass species are Sandberg's bluegrass (POSE) and single spike oatgrass (DAUN). The number of POSE plants varied between sixteen to six plants and the DAUN went from six plants in 1972 to zero in 1979. This would be considered a downward trend. The photos after 1979 showed the addition of a bottlebrush squirreltail plant in 1982. The 1997 photo appears to have some new DAUN plants present. Without a data sheet, this can't be positively confirmed. However, the more recent photos show some apparent improvement in the number of total key species present.

Condition Studies: There were two condition study sites established in the allotment in 1983. PS-1 is located in the riparian area of Rock Creek just north of the bridge on the Stateline road. The ecological site given for this study location was Wet Mountain Meadow. In 1983 the site was given a condition rating of 41, which would be considered fair or mid seral condition. The main plant species (common names) included timothy, sedges, Kentucky bluegrass, Baltic rush, meadow barley, cow clover (?), deer vetch, and dandelion. A follow-up reading of this condition study has not been completed. Thus, any change from the condition observed in 1983 cannot be determined at this time.

The second study is located at the RC-2 Photo Trend site. As mentioned above, logging activities during 1979 impacted the plot location for the photo site. An initial condition rating was done at this site in 1983. Since the condition rating is completed over a larger area, not just a specific point, the logging activities were less of a concern. The site was classified in 1983 as a Juniper Rubbleland ecological site. This site would be dominated by a juniper overstory and the ground surface would be up to 90% rock outcrops and stones. The recent ESI survey classified this area as a Juniper Dry Pine site, which is a more accurate description of the general area. The 1983 rating was a 46, which would be considered fair or mid-seral condition. Using the same data and applying it to a Juniper Dry Pine classification would give a rating of 51. This would bump the rating into the good or late-seral condition range. An ESI write-up that was completed in 1998 at a site approximately one mile south had a rating of 58. Since 1983, there has been a lot of prescribed fire activity in this allotment, which tends to have a suppressing effect on the understory vegetation, primarily the grasses. However, the ESI summary above still shows that these ecological sites are in late-seral condition. The condition site at RC-2 has not been reread since 1983, but it would also likely be in late-seral condition.

Riparian/Wetland Monitoring

Within the Rock Creek allotment there are several riparian/wetland areas. Rock Creek has about three miles of channel within the allotment. About 90% of this is on BLM-administered lands. There are four reservoir/wetland areas within the allotment boundaries. These are all located predominately on private lands. Three of these are reservoirs that receive water diverted from Rock Creek for irrigation of private lands. The other one is a wetland area located in an area known as Adobe Flat. A large shallow reservoir is located below this area. Both of these areas are also on private land. On both the BLM-administered and private lands in the allotment there are several spring sites. One of these on the BLM - Adobe Spring - has been developed to pipe water to a trough for livestock and wildlife use.

Rock Creek

A Proper Functioning Condition (PFC) survey was completed on Rock Creek during 1996. The creek was divided into two sections for the survey. The upper section of the creek was surveyed from riparian photo points RC-R-1 to RC-R-3. The lower section of the creek was surveyed from RC-R-3 to just below RC-R-5. The upper section was rated as being in nonfunctional condition. The main reason for this was the presence of two water diversions that route water to reservoirs on private land. The larger of these two diversions, located near photo point RC-R-2, routes water to Grohs Reservoir which is used for irrigation on the private ranch lands to the south of the allotment. Due to these diversions, this section of creek lacks a consistent flow of perennial water to sustain an adequate population of riparian vegetation necessary for streambank protection. The vegetation that was present had good vigor, but the diversity and amount of vegetation were considered inadequate.

The lower section of the creek was rated as being in proper functioning condition. Riparian vegetation, including sedges, rushes, willows and aspens, was providing good cover for the stream banks. Narrowing of the channel was observed in the lower gradient section below RC-R-4. An excess amount of sediment was also noted. This is likely coming from the upper sections of the creek where the channel is not adequately protected.

As noted above, there are several riparian photo points on Rock Creek. Four of these are located within the Rock Creek allotment. A review of the archive of photos from 1979 through 2000 showed the following:

Photo Point RC-R-2: This section of stream is unconfined with a low gradient. There is not a well-defined stream channel here. The surface is well armored with rocks and boulders and a good vegetation cover. This site is just below the diversion for Grohs Reservoir, so the spring flow is limited. Some of the early photos were taken during early June and two of these, 6/19/84 and 6/11/90, show small pools of surface water. Some of the other photos, taken in August, show some greener areas indicative of the presence of subsurface moisture. There are no riparian shrubs in any of the photos. This section appears to be in a static condition.

Photo Point RC-R-3: This photo point is in a little higher gradient stretch than point RC-R-2. The channel is well armored by rocks and boulders with vegetation present between the rocks. There is also a good stand of aspens at this point with some willows evident in the later photos. No surface water is evident in any of the photos. Due to the extremely rocky nature of the channel here, the water likely goes subsurface early in the year. The conditions here appear to be static with a possible increase in the aspen and willow density.

Photo Point RC-R-4: This section of stream has a wide, vegetated floodplain area with a channel that is well protected by dense sedge, rush, and grass cover. The first photo taken in 1979 shows a bladed trail along the edge of the riparian area. This trail becomes less evident in the succeeding photos and is not evident in the 2000 photo. A small clump of cattails increases in size and density through the photo series. The vegetative cover of the channel and adjacent floodplain also increases in density and vigor with an apparent increase in small willows. Some water is present in photos taken in June and the August photos show no surface water but the channel vegetation is green and dense. Two large pine trees that are next to the channel in the 1979 to 1993 photos have fallen into the stream channel in the 1996 photo. This section of channel is in good condition and appears to be on an upward trend.

Photo Point RC-R-5: This photo point is in a stretch of stream just above the bridge on the Stateline road. In the early photos it is evident that the stream has down cut below its old floodplain. It is not certain whether this is a result of possible realignment of the creek at the time of the bridge construction or if it was caused by other disturbances including livestock grazing. Nearly vertical stream banks with little vegetation cover are visible along the west stream bank. The opposite streambank is more rounded and supports a good cover of grasses and an occasional willow.

As the photo series progresses, the vegetation cover improves. Denser stands of grasses, sedges, and rushes are evident. The willows have dramatically increased in size and density. The vertical banks are still apparent, but some vegetation has started to stabilize the area below them. It appears that a new, lowered floodplain area is establishing. The conditions of this stretch are in an upward trend.

<u>Photo Point PS-2</u>: This photo point is located on a meadow next to Gwinn Spring Creek in the southwest corner of Section 16. This is a piece of private land that is fenced separately from the allotment. The location was first photographed in 1972 with the most recent photo taken in 1997. The photos show a very productive meadow site with a dense grass and forb cover. The site appears to be in good condition with only a few of the photos showing evidence of recent livestock utilization.

<u>Springs</u>

Adobe Spring (a.k.a. Rock Camp Spring) is a developed spring located in Section 8, NW¼ & SW¼. The spring area is fenced to exclude livestock and the water is piped to a trough outside of the exclosure. Maintenance of this spring is the responsibility of the permittee although the BLM did some work on this spring as part of a general repair of springs in the Gerber area during 1995-96. This site would be a good candidate for a juniper reduction project as there is a dense stand of juniper above the spring area.

There are some springs adjacent to Rock Creek in the area just above and just below the bridge on the Stateline road on BLM land. These normally are only evident as greener spots within the riparian areas along the creek. There are also several undeveloped springs on the private lands in the allotment. Some of these in the southeastern portion of the allotment have high perennial output and sustain the flow of Gwinn Spring Creek. Others in the area of Adobe Flat and in Section 8, NE¼ & SE¼ have limited surface flow but sub-irrigate large areas of grasses and sedges.

The upland spring areas on the BLM and private lands within the allotment have received moderate use during the short grazing period in May. They are in good condition and support a diverse population of grasses, sedges, and rushes. The springs within the drainages have received heavier use, but still are in good condition due to good re-growth after the May use period.

<u>Waterholes and Reservoirs</u>

There are several waterholes on the allotment that have been built to provide for better livestock distribution. Several of these were dug as part of road construction activities. As expected, the forage utilization and soil disturbance in the immediate vicinity of these waterholes tends to be intensified. The benefits of better distribution throughout the allotment outweigh these small areas of heavier use.

<u>Standards for Rangeland Health</u>

STANDARD 1 – WATERSHED FUNCTION - UPLANDS
The indicators to be used in determining attainment of this standard include:

- amount and distribution of plant cover
- amount and distribution of plant litter
- accumulation/incorporation of organic matter
- amount and distribution of bare ground, gravel, stone, and rock
- plant composition and community structure
- presence and integrity of biological crusts
- absence of accelerated erosion and overland flow

The ESI information for the Rock Creek allotment shows that approximately 71% of the allotment has vegetation conditions that are classified as late seral or potential natural community. The vegetation communities that are present provide a diversity of plants that provide good ground cover and protection from soil movement. The current livestock grazing in the allotment is not causing significant effects to the upland vegetation and soils. Monitoring has shown that the current season of use and the authorized numbers are resulting in acceptable levels of utilization on the upland areas.

This Standard is currently being met on the allotment.

STANDARD 2 – WATERSHED FUNCTION – RIPARIAN/WETLAND AREAS
The indicators to be used in determining attainment of this standard include:

- frequency of floodplain/wetland inundation;
- plant composition, age class distribution, and community structure;
- streambank/shoreline stability;
- riparian area width;
- sediment deposition;
- point bars revegetating;
- upland watershed conditions;
- frequency/duration of soil saturation; and
- various stream channel characteristics.

The Proper Functioning Condition surveys that have been completed on Rock Creek show that the upper section from riparian photo points RC-R-1 to RC-R-3 was rated as being in nonfunctional condition. The main reason for this was the presence of two water diversions that route water to reservoirs on private land. Due to these diversions there is a lack of perennial flow to support the diversity and amount of vegetation necessary for adequate streambank protection. The photo points for this section show that the area is in a static condition with a possible increase in some of the riparian shrub species. Utilization monitoring point #2 is also within this section of the stream. Recent livestock use here has been within acceptable limits for riparian areas but past use has exceeded this level. The remaining stretch of Rock Creek is in good condition and current livestock grazing is not causing significant negative impacts to the riparian area or stream banks. Monitoring shows that the area is in an upward trend with increasing vegetation and stream banks that are stabilizing. The springs on the BLM lands within the allotment are in good condition. Some juniper control is needed at Adobe Spring. Some livestock use is made on the undeveloped springs and wet meadow areas throughout the allotment, but with the early use period these areas have adequate time for vegetation re-growth.

This Standard is currently not being met due to the nonfunctioning section of Rock Creek. Current livestock grazing is not the primary reason for this rating, but use in this area needs to be limited due to the fragile vegetative conditions of the riparian area. Livestock utilization levels in this section have exceeded the RMP standards in past years.

STANDARD 3 – ECOLOGICAL PROCESSES
The indicators to be used in determining attainment of this standard include:

- plant composition and community structure;
- accumulation, distribution, and incorporation of plant litter into the soil;
- animal community structure and composition;
- root occupancy in the soil profile; and
- biological activity including plant growth, herbivory, and rodent, insect, and microbial activity.

The ESI survey completed on this allotment shows that nearly all of the various ecological sites are in late seral or PNC condition. The various vegetation communities and soils associated with these sites are

effectively supporting the ecological processes of energy flow and nutrient cycling. General observations indicate that the allotment supports a good wildlife population including deer, wood rats, squirrels, and various bird species.
This Standard is currently being met on the allotment.

STANDARD 4 – WATER QUALITY
The indicators to be used in determining attainment of this standard include:

- water temperature;
- dissolved oxygen;
- fecal coliform;
- turbidity;
- pH;
- populations of aquatic organisms; and
- effects on beneficial uses.

. Water temperature in Rock Creek was monitored during 2001 and 2002. Observed water temperatures exceeded the state water quality standards. Because this monitoring occurred during years with relatively low streamflows, it is not clear whether this is a long term issue or not. Continued monitoring will help ascertain whether the Standard is met. Regardless, BLM management is oriented towards maintaining and/or restoring riparian conditions and water quality.

Rock Creek and at least one spring would be considered perennial water sources on the allotment. A section of Rock Creek was determined to be in nonfunctioning status through a Proper Functioning Condition survey completed in 1996. The main reason given for this determination was the diversion of water from the creek to irrigation reservoirs on the adjacent private land. This diversion of water is not under the control of the BLM. The current livestock grazing use on the allotment is not having a significant negative effect on the water quality of Rock Creek. Monitoring of the riparian areas show that conditions are in a static to upwards trend. Some of the created waterholes within the allotment have had moderate to heavy use within their immediate vicinity. The positive effects of better livestock distribution and decreased use of the natural water sources outweigh these relatively limited impacts.

STANDARD 5 – NATIVE, T&E, and LOCALLY IMPORTANT SPECIES
The indicators to be used in determining attainment of this standard include:

- plant community composition, age class distribution, and productivity;
- animal community composition, productivity;
- habitat elements;
- spatial distribution of habitat;
- habitat connectivity; and
- population stability/resilience.

Inventory and monitoring of the allotment has shown that there are various ecological sites with plant communities that are in good condition. These communities are providing habitat for the various dependent native wildlife and plant species. There are no known populations of Special Status animal or plant species in the allotment. There are several populations of noxious weeds in the allotment – see that section of this analysis for more information. This Standard is currently being met on the allotment.

The KFRA ROD/RMP listed three specific “Identified Resources Conflicts/Concerns” and related “Management Objectives” for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Timber Hill Allotment (0889)

Timber Hill is a moderately high priority "I" category allotment that also has a significant amount of unfenced, privately owned, lands intermingled with the BLM administered lands. Reflecting its priority, this allotment has received a moderate amount of rangeland monitoring attention through the years. The *Rangeland Health Standards Assessment* for this allotment was completed in 1999 and found that the overall current grazing use was within the sustained yield capacity of the allotment and appropriate for maintaining the current overall good vegetation conditions. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized as necessary in the following narrative. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health. Some additional monitoring information has also been collected since completion of the Assessment and will be discussed.

Ecological Site Inventory: Since Assessment completion, the ESI vegetation information has been refined so that a very accurate figure is available for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres has also been calculated to a more accurate level. That information is summarized as follows:

Total Timber Hill Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	0	1640.84	0
Pine-Mahogany-Fescue	0	9.94	0	0
Juniper Dry Pine	0	1088.03	0	0
Juniper Claypan 16-20"	259.03	86.17	0	0
Juniper Claypan 12-16"	0	177.20	0	0
Shallow Stony 10-20"	0	382.45	0	0
Ephemeral Lakebed	5.16	0	0	0
Dry Meadow	0	3.33	0	0
Totals*	264.19	1747.12	1640.84	0

*Acres breakdown: public - 75.4%, private - 24.6 %

Condition Classes	% of total classified
Potential Natural Community	7.2%
Late Seral	47.8%
Mid Seral	45.0%
Early Seral	0%

The ESI information shows that this allotment has a large amount (45%) of mid-seral vegetation, all of which is in the true pine sites, i.e. in the *Pine-Sedge-Fescue* ecological site. These sites technically rated out as late seral, but were downgraded due to production. The mid-seral pine sites were addressed in the Assessment as follows: *"…virtually all of the pine related ecological site areas - sites which dominant this allotment - are also in Late Seral, but have variably reduced production due to past timber harvest activities and recent prescribed burning. This underburning has concentrated on the pine areas and has reduced the understory shrub component significantly - a component that takes many years to regenerate. However, this underburning has also reduced the duff layer underneath the trees, allowing for a resurgence of the herbaceous community. In particular, bottlebrush squirreltail and western needlegrass - both desirable mid seral perennial grasses - are very common in most of the pine areas. All of this regeneration is occurring incrementally and the trend in most pine areas is definitely upwards."* During the fall of 2002, a large amount of the pine areas in the Timber Hill allotment were underburned yet again. This additional burning has inevitably "set back" the ecological conditions by reducing the shrubs once again. None of the mid seral conditions are attributable to livestock grazing. In addition, all of the drier ecological sites which exhibit more of a true "rangeland" character, were in late seral to PNC.

The following was also noted in the Assessment about the juniper increases and densities: One very significant ESI observation is that most ecological sites in the Gerber area have been and are continuing to experience increased densities of western juniper. These increases are probably primarily due to the combined effects of fire suppression, historic livestock grazing, and possibly past timber harvest activities in the Timber Hill (Brady Butte) area. The juniper increase has the future potential to dramatically effect ecological conditions more than it already has. This could include decreased forage production for wildlife and livestock, increased erosion potential due to diminished ground cover, mono-culture vegetation types that decrease wildlife diversity, decreased water availability, and other impacts. These observations are summarized as follows:

"The spaces between the older junipers (150-1000+ years old) in the "old" juniper sites (Juniper Claypan 12-16" & Juniper Claypan 16-20") are being slowly filled in with much younger trees - way beyond what would be needed for replacement of the older trees as they die off (very slow!).
The shallow soil, non-juniper sites (Stony Claypan 14-20", Shallow Stony 10-20") are all experiencing varying increases in juniper, with the juniper generally increasing proportionally as soil depth increases. However, some of these areas are also seasonally (winter/spring) saturated - particularly the Shallow Stony 10-20" - which appears to suppress the juniper encroachment.
Most of the other, deeper soil and non-pine ecological sites, that should have juniper as a minor late seral/ PNC component, are experiencing massive increases in juniper density. On the Timber Hill allotment there is only one of these ecological sites: Juniper-Pine-Bunchgrass 12-16". Of particularly concern is the fact that in some of these sites the mountain mahogany component is collapsing due to the juniper competition. These areas are probably the most important to consider for juniper reduction activities as they would have the highest beneficial results to wildlife.
The ponderosa pine areas (Pine-Mahogany-Fescue 16-20" and Pine-Sedge-Fescue sites) are also experiencing dramatic increases in juniper. This competition is placing pressure on the pine component of the community and is also causing the same problems with mountain mahogany as noted above."

<u>Condition & Trend Studies</u>: There is one key area in the Timber Hill allotment (TH-1), located in the northern end of the allotment about ½ mile south of Alkali Spring. This key area has both a frequency (established 1991) and photo trend plot (established in 1975) and a condition transect (established in 1983). All of the studies have been read several times through the years, with the photo trend having the most re-readings. To summarize this data, these studies show that the area is in relatively good current condition, has improved slowly over the years of readings, and still has a trend that is static to slightly upwards. (See the Assessment for complete monitoring summary.)

As in other sections, the observed apparent trend estimate was a collateral, qualitative observation made as part of the ESI efforts. All of the inventory vegetation worksheets (21) that pertain to this allotment rated the trend as either static or upward; there were no downward trends noted. Specifically, 12 worksheets estimated upward trends and 9 static trends. For the 9 static trend areas, 1 was rated as mid seral, 7 were late seral, and 1 was PNC - all in acceptable or better ecological condition (the mid seral area was discussed in the ESI section above). Late seral and PNC areas are less likely to show upward trends since they are already in an elevated ecological condition and have less "room" to improve. Static trend is entirely appropriate for vegetation communities that are already in good condition.

<u>Utilization Studies</u>: Utilization has been periodically read on this allotment since the mid-1980's, with several use pattern maps prepared since the mid 1990's. The following information pertaining to the utilization studies is from the 1999 Assessment: "*The utilization data from the established points has shown overall appropriate (moderate or less) average upland utilization, with the exception of 1986. In 1986, the grazing use was for a very extended season with relatively high livestock numbers - 250 head from 7/10 to 10/30 (929 AUMs which is almost 3½ times the active preference). Not surprisingly, utilization ranged from*

68% to 84% - mid heavy to low severe…Even though a few use points in a couple years (since 1986) had a heavy use reading, there appears to be no chronically overused areas. The utilization pattern mapping … has also confirmed consistently acceptable overall patterns of use throughout the allotment. Utilization averaged light in all 3 years - with a few very small areas of moderate utilization…and indicate(s) *that the existing grazing levels are appropriate to maintaining good vegetation conditions.* Since the Assessment was completed, another year of information has been collected (late 1999); it affirmed the conclusions of Assessment that currently permitted grazing use is still appropriate.

Other Upland Monitoring: During the ESI, several other observations were made relative to resource conditions. One observation was the Soil Surface Factor (SSF), which is a qualitative expression of current soil erosion activity. For this allotment, 21 different vegetation write-up sheets were prepared. 4 write-ups indicated stable conditions, 15 showed slight erosion, and 2 rated as moderate erosion activity. As noted earlier, even this limited erosion activity is somewhat overstated due to the natural inclination of the perennial bunchgrasses to form pedestals in the area's high clay soils. Overall, these observations though qualitative in nature, nonetheless indicate that erosion is a limited concern on this allotment's uplands.

The last of the ESI collateral observations was a qualitative rating of the cryptogamic (biological soil) crusts. (A description of the rating system was explained in the Horsefly allotment section – see for more information.) The average rating of the vegetation write-up sheets for this allotment was 3.8 on a scale from 0 to 10, with a range from 1 to 6. This is a slightly below average for the Gerber Block, but not much. Given the limited knowledge of the ecology and significance of these crusts in this area we can not make any particular conclusions from this, except a higher level of biological crusts would probably be better for continued or enhanced resource conditions.

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following summarized conclusions in regards to the 5 Standards for Rangeland Health:

STANDARD 1 - WATERSHED FUNCTION – UPLANDS: This standard is being met on the allotment. The overall static/upward trends and existing high seral state rangeland vegetation communities strongly indicates proper functioning upland conditions. The high amount of mid seral pine is not a cattle related ecological condition problem, as explained previously. Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS: This standard is being met on the allotment. The following is from the Assessment: "*Timber Hill has no riparian or wetland areas on the public lands within the allotment. The closest would be the private lands on Adobe Flat (spike-rush meadows) or the Antelope Riparian pasture to the north of the allotment. This latter pasture is fenced separately from Timber Hill and is included as part of the neighboring Willow Valley allotment. Alkali Spring, located immediately south of the Antelope Riparian pasture fence in the Timber Hill allotment, is a "buried" spring source with a very small and insignificant sedge/grass patch supported by the overflow from the trough."*

STANDARD 3 - ECOLOGICAL PROCESSES: This standard is being met on the allotment. The high seral state rangeland vegetation communities dominating this allotment strongly indicate that the ecologic processes of nutrient cycling, energy flow, and the hydrologic cycle are properly functioning. (The high amount of mid seral pine is not a cattle related ecological condition problem, as explained previously.) Currently permitted grazing use appears to be sustainable and appropriate.

STANDARD 4 - WATER QUALITY: This standard is being met on the allotment. The following from the Assessment: "There are no perennial waters on the public lands within this allotment besides a few dugout watering holes and Alkali Spring on the extreme north end. Additional stock watering is provided by water on privately owned lands on Adobe Flat. There are no known water quality problems within the actual allotment boundaries."

STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES: This standard is being met on the allotment. The high seral state rangeland vegetation communities dominating this allotment strongly indicate that wildlife habitat conditions are appropriate. (The high amount of mid seral pine is not a cattle related ecological condition problem, as explained previously.)

The KFRA ROD/RMP listed three specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

Willow Valley Allotment (0890)

Willow Valley is the second largest allotment in the KFRA (almost 10% of the Resource Area) and has resource issues that make it one of the highest priority "I" category allotments. It has been a long-term priority allotment and thus has had extensive amounts of rangeland monitoring studies established and read on it over the past 30+ years. The *Rangeland Health Standards Assessment* for this allotment was completed in 2000, determining that there were still resource issues/problems that needed enhanced management to remedy – particularly in the Woolen Canyon and Willow Valley Chaining pastures. That management is being implemented through the leverage and parameters of the existing grazing permits. Though that Assessment will not be reiterated here, some of the findings and information will be briefly summarized as necessary in the following narrative. This includes the final conformance/non-conformance determinations on each of the 5 Standards for Rangeland Health. Some additional monitoring information has also been collected since completion of the Assessment and will be discussed.

Ecological Site Inventory: Since Assessment completion, the ESI vegetation information has been refined so that a very accurate figure is available - by pasture - for the number of acres of each vegetation type (ecological site) by condition class rating. The number of public and private acres by pasture has also been calculated to a more accurate level. That information is summarized as follows:

Willow Valley Chaining – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Juniper Claypan 12-16"	23.70	736.27	1539.86	0
Shallow Stony 10-20"	0	585.97	96.53	0
Juniper Loamy Hills 10-14	0	1031.82	725.99	0
South Slopes 14-18"	46.09	0	87.12	0
North Slopes 14-18"	0	34.63	0	0
Totals*	69.79	2388.69	2362.38	0

*Acres breakdown: public - 100%, private - 0 %

Condition Classes	% of total classified
Potential Natural Community	1.4%
Late Seral	49.5%
Mid Seral	49.1%
Early Seral	0%

Woolen Canyon Pasture – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Mahogany-Fescue	0	34.24	0	0
Juniper Claypan 12-16"	829.91	1583.57	2566.47	173.02
Stony Claypan 14-20"	26.59	28.57	0	0
Shallow Stony 10-20"	0	1481.10	85.36	0
Ephemeral Lakebed	0	20.29	0	0
Dry Meadow	0	18.08	0	0
South Slopes 14-18"	58.45	0	31.01	0
North Slopes 14-18"	0	43.41	0	0
Totals*	914.95	3209.26	2682.84	173.02

*Pasture also contains 8.85 acres of defined rock outcrops and approx. 403.08 acres of water - all of which are not included in the totals. Acres breakdown: public – 98.5%, private – 1.5 %

Condition Classes	% of total classified
Potential Natural Community	13.1%
Late Seral	46.0%
Mid Seral	38.4%
Early Seral	2.5%

Notch Corral Pasture – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	32.41	618.20	0
Pine-Mahogany-Fescue	0	21.48	0	0
Juniper Dry Pine	0	433.83	0	0
Juniper Claypan 16-20"	505.15	0	0	0
Juniper Claypan 12-16"	3574.44	257.29	0	0
Stony Claypan 14-20"	15.97	142.62	0	0
Shallow Stony 10-20"	0	899.54	0	0
Juniper Mahogany Fescue	0	196.08	0	0
Totals*	4095.56	1983.25	618.20	0

*Total does not include 7.03 acres of water on BLM lands. Acres breakdown: public-97.8%, private-2.2 %

Condition Classes	% of total classified
Potential Natural Community	61.2%
Late Seral	29.6%
Mid Seral	9.2%
Early Seral	0%

Antelope Pasture – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	29.97	208.87	0
Pine-Mahogany-Fescue	0	363.81	0	0
Juniper Dry Pine	0	77.71	0	0
Juniper Claypan 16-20"	1395.96	39.31	0	0
Stony Claypan 14-20"	11.64	538.24	0	0
Claypan 14-20"	100.35	49.44	0	0
Claypan Bottom 12-18"	0	24.52	0	0
Shallow Stony 10-20"	0	245.08	0	0
South Slopes 14-18"	0	0	56.11	0
Totals*	1507.95	1366.18	264.98	0

*Pasture contains approx. 141.14 acres of water – 77.68 private and 63.46 BLM - which is not included in the totals. Acres breakdown: public – 77.9%, private – 22.1 %

Condition Classes	% of total classified
Potential Natural Community	48.1%
Late Seral	43.5%
Mid Seral	8.4%
Early Seral	0%

Antelope Riparian Pasture – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	0	42.68	0
Pine-Mahogany-Fescue	0	57.01	0	0
Juniper Dry Pine	0	41.07	0	0
Juniper Claypan 16-20"	73.99	0	0	0
Ephemeral Lakebed	25.49	0	0	0
Dry Meadow	0	95.30	0	0
Totals*	99.48	193.38	42.68	0

*Pasture contains 4.48 acres of water not included in the totals. Acres breakdown: public-83.6%, private-16.4%

Condition Classes	% of total classified
Potential Natural Community	29.7%
Late Seral	57.6%
Mid Seral	12.7%
Early Seral	0%

Duncan Riparian Exclosure – Willow Valley Allotment – Total acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Mahogany-Fescue	0	88.67	0	0
Juniper Claypan 12-16"	11.26	1.84	1.12	0
Shallow Stony 10-20"	0	3.07	0	0
Totals*	11.26	93.58	1.12	0

*Pasture contains 1.66 acres of unclassified riparian along stream course. Acres breakdown: public-100%, private-0%

Condition Classes	% of total classified
Potential Natural Community	10.6%
Late Seral	88.3%
Mid Seral	1.1%
Early Seral	0%

Total Willow Valley Allotment Acres by Ecological Site & Condition Class

Ecological Site	PNC	Late Seral	Mid Seral	Early Seral
Pine-Sedge-Fescue	0	61.48	869.76	0
Pine-Mahogany-Fescue	0	564.21	0	0
Juniper Dry Pine	0	552.61	0	0
Juniper Claypan 16-20"	1975.10	39.31	0	0
Juniper Claypan 12-16"	4439.31	2578.97	4107.45	173.02
Stony Claypan 14-20"	54.20	708.93	0	0
Claypan 14-20"	100.35	49.44	0	0
Claypan Bottom 12-18"	0	24.52	0	0
Shallow Stony 10-20"	0	3214.76	181.89	0
Ephemeral Lakebed	25.49	20.29	0	0
Dry Meadow	0	113.38	0	0
Juniper Mahogany Fescue	0	196.08	0	0
Juniper Loamy Hills 10-14	0	1031.82	725.99	0
South Slopes 14-18"	104.54	0	87.12	0
North Slopes 14-18"	0	78.54	0	0
Totals*	6698.99	9234.37	5972.21	173.02

*Allotment contains 8.85 acres of defined rock outcrops, 1.66 acres of unclassified riparian along stream courses, and approx. 555 acres of water not included in the totals. Acres breakdown: public-94.2%, private-5.8%

Condition Classes	% of total classified
Potential Natural Community	30.3%
Late Seral	41.8%
Mid Seral	27.1%
Early Seral	0.8%

The ESI information shows that conditions on this allotment vary widely – from pastures that are dominated by late seral and PNC (Notch Corral & Antelope) to those which have some long term condition issues (Willow Valley Chaining & Woolen Canyon) which were discussed previously. Specifically, the lower in elevation, more southerly the aspect, and less rocky an area is the more condition has been impaired – probably permanently - by past historical grazing pressures. Both the Chaining and Woolen Canyon pastures have large areas that meet these criteria and thus have the most condition issues. The *Rangeland Health Standards Assessment* suggested numerous management changes to help improve conditions; changes which began to be fully implemented through the existing grazing permits during the 2001 grazing season, though much management was already in place prior to the Assessment (see Step 6 for more information).

During 2000-2001, the Woolen Canyon pasture received juniper control (i.e. shearing and piling and future pile burning) on 1462 acres within a *Juniper Claypan 12-16"* ecological site just north of the CCC road. All of the treatment area lies within the previously discussed 1937 burn that eliminated most of the true old (<150 year old) juniper trees. The control activities removed most of the post-fire juniper re-growth, leaving an average of about 5 of the "oldest" trees per acre to become future "old growth". These areas were appropriately treated given there status as true old juniper sites. These treatments have and will continue to affect the condition of these areas - the progression of which will be closely monitored in the years to come with an array of recently established vegetation studies. These ares also have a relatively high potential of increased exotic annual grass (bromes and medusahead) infestation – measuring the status of which is also an important part of the ongoing monitoring.

Other Condition Studies: Key area based condition studies were formally established and read in 1996 and 1997 at the trend plot locations in the Notch Corral, Woolen Canyon, and Antelope pastures. (The latter two pastures were rough relocation and permanent marking of range condition studies first done in 1983.) In addition, another condition study was established in 2001 for juniper treatment monitoring in the north end of the Antelope pasture. This ESI derived condition study allows for an initial quantitative assessment of the current vegetative conditions as well as establishes a baseline for future comparison on a specific key area. These studies allow for future, specific quantification of vegetation changes indicated by the accompanying trend study reading and will only be re-read if the trend study shows that significant change has occurred.

The initial readings on these studies found widely varying existing conditions - similar to and consistent with the ESI information. The Woolen Canyon pasture study found low mid seral condition (30% of PNC) at the key area; both Antelope pasture studies were PNC (both rated out 82%); and Notch Corral was also PNC (77%). A primary attribute of the management proposed (and implemented) via the Assessment was to significantly lessen the grazing use in Woolen Canyon by shifting more of it Notch Corral and Antelope. It is thought that this will allow for condition improvements in Woolen Canyon while having at worst a neutral resource effect on the other pastures.

<u>Trend Studies</u>: Like the other major Gerber allotments, Willow Valley has several different types of trend studies – photo trend, frequency trend, and observed apparent trend. The photo trend studies are the longest term in the area, some having been established as early as 1967 in the Willow Valley Chaining. These studies generally show static to upward trends, with the exception of the Woolen Canyon study, which is static to downwards – not unexpectedly given the conditions.

Frequency trend studies were established in the Notch Corral (1997), Woolen Canyon (1996), and Antelope (1996) pastures. An additional juniper treatment related one was also established in the northern portion of Antelope in 2001, but since there has been no re-reading there can be no trend ascertained. The two 1996 established studies were re-read the first time in 2001 with neither showing any particular trend one way or the other, i.e. static trend. . The Notch Corral study was re-read in 2002 and found no distinct trend, though bottlebrush squirreltail did decrease significantly. This was offset with Thurber's neeedlegrass being indicated for the first time. There was no significant change in the other desirable plants.

The Observed Apparent Trend (OAT) was determined as a collateral, qualitative observation made as part of the ESI survey in 1997-98. Of the 27 inventory vegetation worksheets that pertain to this allotment, 9 indicated upward trends, 13 static, and 5 downward. 4 of the 5 downward trend sites were in the Willow Valley Chaining or Woolen Canyon pastures. The conditions of these have already been discussed previously and these downward trend estimates are consistent. The fifth downward observation was in the Antelope pasture in a particularly "scabby" *Shallow Stony 10-20"* ecological site that was otherwise in good (late seral) condition but estimated to have above below average production and vigor and above average erosion. Overall, the OAT ratings are consistent with other monitoring observations that have eventually evolved into a weighting of management on the allotments two problematic pastures – the Willow Valley Chaining and Woolen Canyon.

<u>Utilization Studies</u>: Utilization point studies have been periodically read on this allotment since the mid-1980's, with use pattern mapping done frequently since the early 1990's. To quote the Willow Valley Assessment – *"Most years showed slight to light use over 80% of the allotment with light to heavy levels near the water sources"* and *"Distribution does not appear to be a major problem on the allotment."* Utilization information collected (2001) since completion of the Assessment also supports these statements. Overall utilization levels have been appropriate and consistent with resource objectives (ROD/RMP). However, with the previously discussed condition problems, control of the livestock utilization levels becomes the most important tool in ensuring that trends in the noted problem areas are upwards. The grazing management has been implemented and refined in recent years to accomplish this type control of utilization levels (see Step 6).

<u>Other Upland Monitoring</u>: As noted previously, during the ESI several other observations were made relative to resource conditions. One observation was the Soil Surface Factor (SSF), which is a qualitative expression

of current soil erosion activity. For this allotment, 27 different vegetation write-up sheets were prepared. 5 write-ups indicated stable conditions, 10 showed slight erosion, and 12 rated as moderate erosion activity. This average erosion level is on the relatively higher end for the Gerber Block reflecting the historical abuse of significant portions of this allotment by unrestricted historical grazing use.

The last of the ESI collateral observations was a qualitative rating of the cryptogamic (biological soil) crusts. (A description of the rating system was explained in the Horsefly allotment section – see for more information.) The average rating of the vegetation write-up sheets for this allotment was 3.4 on a scale from 0 to 10, with a range from 2 to 6. This is below average for the Gerber Block and another indicator of the ecological decline related to the historical grazing pressures permanently degrading conditions. Given the limited knowledge of the ecology and significance of these crusts in this area we can not make any particular conclusions from this, except a higher level of biological crusts would probably be better for continued or enhanced resource conditions.

<u>Riparian Monitoring</u>: An assortment of riparian related monitoring studies and surveys have been established/read on this allotment, primarily in Antelope Creek north of Willow Valley Reservoir, and to a lesser degree, the East Branch of the Lost River below the reservoir. These studies include long-term riparian photo points, riparian utilization, stream cross-section and greenline riparian vegetation plots, and proper function condition (PFC) determinations. A complete summary of the riparian monitoring is found in the Willow Valley Assessment and will not be repeated here. (Also see the riparian sections of this analysis.) However, the analysis of the riparian information in the Assessment did conclude, with one exception, that the riparian/wetland areas in the allotment are either in proper condition or are adequately trending towards the proper resource condition. The exception is that the portion of Antelope Creek (1.1 miles of drainage) above the Duncan Springs exclosure was rated as less than PFC, i.e. 0.8 mile as Non-functional and 0.3 as Functional – At Risk. Since completion of the Assessment, changes in grazing management have been implemented to address these problems, primarily through changes in the pasture rotation sequence and timing. The ongoing array of monitoring studies will continue to be periodically read to ascertain whether this management is improving conditions or not. (See *Step 6 – Recommendations* for more information).

In summary, the analysis and allotment specific information presented in this and the preceding 4 Steps do not significantly alter the conclusions from the completed *Rangeland Health Standards Assessment.* That analysis arrived at the following conclusions in regards to the 5 Standards for Rangeland Health; the explanation statements below are quoted from the Assessment:

<u>STANDARD 1 - WATERSHED FUNCTION – UPLANDS:</u> "This standard is being met on the majority of the allotment. The various studies and ESI components sited above as indicators affirm that the uplands are in a functional state. The one area where there may be shortfalls is in the vegetation composition. Some areas of the Willow Valley Chaining and Woolen Canyon pastures have vegetation conditions that are in the low to mid seral state and production levels that are much lower than average. These areas have high levels of introduced species like cheatgrass, medusahead, and various weedy forbs. Junipers have also increased in numbers and are becoming established in ecological sites outside of their natural range. The increase in non-native species and the expansion of junipers is beginning to cause a shift in the vegetation communities in some sites. This is leading to increased overland flow due to the decreased perennial vegetation cover. The junipers and cheatgrass also use water throughout a larger portion of the soil profile and earlier and later in the growing season. This may lead to a decrease in available soil moisture and a subsequent lowering of the water table in some areas. Management actions to address the non-native species and the juniper invasion will be addressed in the Management Recommendations section of this evaluation."

<u>STANDARD 2 - WATERSHED FUNCTION - RIPARIAN/WETLAND AREAS:</u> "This standard is not being met on all of the allotment. The section of Antelope Creek above the Duncan Springs exclosure was rated as Nonfunctional during Proper Functioning Condition surveys in 1996. Other riparian areas that were

surveyed were rated as Proper Functioning Condition or Functional-At-Risk.

The Nonfunctioning section of Antelope Creek is an intermittent stream that flows in the spring and during heavy rainfall events. Much of the flow from upstream is diverted to Antelope Flat, a private meadow, for irrigation. Water that is contained in Antelope and Kilgore reservoirs is used to irrigate Antelope Flat in the late spring and summer. Excess flow from this irrigation flows through this section of Antelope Creek. Rock check dams were constructed by the BLM in the early 1990's in this section of the creek. Small pools that typically hold water through the summer have formed behind these structures.

Through the Nonfunctioning section there is some riparian vegetation present, but not enough to dissipate the energy during high flows or to effectively capture sediments. There are also areas where the stream banks are lacking vegetation and have been eroded by a combination of livestock hoof action and high water flows.

This section of Antelope Creek needs time to reestablish a good vegetative cover. This will require a change in the grazing management for this area that results in lower vegetation utilization levels and decreased stream bank impacts. These changes are outlined in the Management Recommendations section of this evaluation. This section of Antelope Creek is situated between private land and the exclosure fence that protects the perennial flows below Duncan Spring. Fencing this section of the creek would probably result in little additional benefit, compared to the proposed change in grazing management. The creek will be monitored to determine if the proposed grazing changes result in upwards trends. If not, the need for fencing will be re-evaluated.

An assessment of the standing water riparian areas has not been completed for this allotment. This would include reservoirs, springs, seeps, and seasonal wetlands. When an evaluation of these areas is completed, appropriate management changes will be made as necessary to correct any Nonfunctional ratings."

<u>STANDARD 3 - ECOLOGICAL PROCESSES:</u> "This standard is being met on the majority of the allotment. The data collected during the ESI and evaluated throughout this document indicate that productive native plant communities are present throughout the allotment to support the dependent resources. As mentioned in Standard 1, there are some areas in the Willow Valley Chaining and Woolen Canyon pastures where exotic grasses have invaded and juniper has expanded causing a shift in the vegetation communities. This may be causing a change in the nutrient cycling, energy flow, and hydrologic cycle due to the ability of these plants to use soil water and nutrients in differing quantities and at different times of the year than the native plant communities. These areas will be addressed in the Management Recommendations section of this evaluation."

<u>STANDARD 4 - WATER QUALITY:</u> *"It is unknown whether this standard is being completely met on the allotment. No stream segments in the allotment are on the State 303(d) list of water bodies that do not meet water quality standards. However, water quality studies have only been done on the perennial section of Antelope Creek. No studies have been done on East Branch Lost River, the upper sections of Antelope Creek or the reservoirs within the allotment. Monitoring of these areas will be addressed in the Management Recommendations section of this evaluation."*

Antelope Creek is included on the Oregon 303(d) list for water temperature. Long term monitoring of the East Branch of the Lost River is necessary to determine compliance with state water quality standards on this stream. See the narrative for Standard 2 and the management recommendations in Step 6 for an explanation of how impacts to riparian vegetation and stream channels are being addressed on BLM lands.

<u>STANDARD 5 - NATIVE, T&E, and LOCALLY IMPORTANT SPECIES:</u> "This standard is being met on the allotment. ESI surveys show that most of the allotment supports native vegetation communities. Some introduced species have become established and in some areas are out-competing the native plants. Junipers

are also increasing in some areas to the detriment of the established vegetation. Some of these sites will be addressed in the Management Recommendations section of this evaluation. There are no special status species plants or animals in the allotment."

The KFRA ROD/RMP listed seven specific "Identified Resources Conflicts/Concerns" and related "Management Objectives" for this allotment. One or more of the 5 Standards at least adequately addresses each of these objectives. Current management is believed to be either currently meeting, or appropriately moving towards meeting, all the allotment specific Land Use Plan objectives. Current grazing management is also meeting the Oregon/Washington *Guidelines for Livestock Grazing Management*.

William's Allotment (0892)

The William's allotment is located north of Lorella, in the extreme northwestern BLM portion of the analysis area and is outside of the BLM's contiguous Gerber Block. As noted in Step 3, Williams is a very minor component of the Yainax Butte Coordinated Resource Management Plan (CRMP) area, which is comprised mostly of Fremont National Forest and private lands. In addition, much of this allotment is outside the analysis area boundaries.

A *Rangeland Health Standards Assessment* is planned for completion on this allotment in 2004, and not as part of this document. ESI information was collected on this allotment in late 2002 and will form the basis for the Assessment since little other monitoring information has been collected on this area. This watershed analysis will be a useful source of information also.

USFS Administered Lands - Fremont National Forest

The Fremont National Forest Plan sets up the standards and guidelines upon which management is based in order to achieve our long-term goals. Some of these are as follows:

- To maintain or improve the productivity of the soil in all resource management activities
- To re-establish all degraded land to a productive state
- To maintain or improve vegetation condition of rangelands through the use of available silvicultural practices and livestock management while providing for other resource uses.
- To restore and maintain all riparian areas in a condition which enhances riparian dependent resource values.

The Forest Service has not yet performed a comprehensive range assessment on an allotment-specific basis. Range resource analysis is scheduled to be performed for each allotment individually (Table 5-9).

Table 5-9. Scheduled range analysis for each allotment within the Gerber watershed area.

Allotment	Year
Barnes Valley	2002
Horsefly	2002
Bly Ridge	2003
Yainax	2003
Arkansas	2004
Privy Spring	2004
Pitchlog	2004
Fort Springs	2004
Bear Valley	2005
Dent Creek	2005
Wildhorse	2005

This section will contain a more general description and provide monitoring data where available. Annual monitoring in each allotment is performed to determine compliance with standards and guidelines identified in the Fremont National Forest Plan. Utilization is the monitoring method used to evaluate on a yearly basis livestock use of the forage resource.

When utilization standards are not met for any given year, a one-year grace period is given to make management adjustments and move the pasture back to meeting utilization standards. If changes are occurring on a yearly basis, because standards are continually not being met, a change in the permit will occur. The change may be in the permitted numbers, season of use, or length of use. Current range management practices within the watershed are considered adequate (i.e. standards and guidelines are being met) to sustain and/or promote riparian and upland ecosystem health. Managing the rangeland according to the standards and guidelines set by the Forest Plan on an annual basis will be consistent with long-term resource sustainability. Monitoring the vegetation through long-term range studies will also ensure proper grazing management. Long-term range vegetation monitoring will be discussed more thoroughly in the vegetation section. The following is a summary of annual monitoring for each allotment for the last five years.

<u>Arkansas</u> – This allotment did not meet utilization standards last year in one pasture out of the three pastures that make up this unit due to drought conditions. Otherwise in the last five years utilization standards have been met every year.

<u>Barnes Valley</u> – Vegetation has met utilization standards for the past four years. In 1997 the riparian pasture did not meet standards due to a lack of fencing.

<u>Bly Ridge</u> – This allotment has met utilization standards for the last five years. Note that this allotment has been vacant since 1995.

<u>Horsefly</u> - This allotment has met utilization standards for the last five years.

<u>Privy Spring</u> - This allotment has met utilization standards for the last five years.

<u>Pitchlog</u> - This allotment has met utilization standards for the last five years.

<u>Yainax Butte</u> – Two pastures in 2001 did not meet utilization standards out of 12 pastures in the allotment due to drought conditions. The previous four years all pastures met the utilization standards.

<u>Bear Valley</u> – This allotment has met utilization standards for the last five years.

<u>Dent Creek</u> – This allotment has met utilization standards for the last five years.

<u>Wildhorse</u> – This allotment has met utilization standards for the last five years.

Range management in this area has changed significantly over the past 30 to 40 years. Reduced animal numbers and pasture rotations have led to an overall improvement in range conditions and riparian habitat. Partnership agreements with permittees have benefited both the permittee and the resources. Improvements continue to occur obtaining better use of livestock as a tool for improving vegetation and promoting ecological diversity. Livestock grazing in the watershed has and continues to contribute to the social and economic well being of the surrounding communities.

Recreation

Within the watershed, the development of improved road systems, better off-highway type vehicles (pick-up trucks and sport-utility vehicles) and recreational vehicles have had the most significant influence on recreation use numbers and types of recreation activities. In combination with an increasing population, greater disposable incomes and leisure time after World War II, these human influenced changes have served to change the landscape. In addition, the stocking of area reservoirs with game fish and management of wildlife species/habitat have enhanced fishing, hunting and wildlife viewing opportunities. The development of improved campgrounds and day use facilities has had a secondary influence on attracting additional recreation visitation.

Recreation use in the watershed greatly expanded in the 20th century. For the first half of the century, motorized travel was slow on unimproved roads and impassable for many months due to mud and snow. A trip to Gerber reservoir and back to Klamath Falls would be an all-day event just 50 years ago! That same trip today takes about two hours round-trip, on paved roads. Today, the reservoir area is accessible year-round to the entrance of the recreation site as Klamath County plows the road in winter. Winter activities such as fishing and picnicking, while not common, are now readily available. Increased access has negatively affected sensitive cultural/historical sites and meadows, and has likely caused additional harassment and displacement of wildlife and livestock.

While recreation use numbers before the 1980s for the Gerber Reservoir area are unavailable, it is estimated that use was fairly light until the mid-1960s or so. General visitation use numbers peaked in the early 1980s, when fishing was exceptionally good at Gerber Reservoir. Since then, use has declined but has leveled off. Visitation at Gerber reservoir is strongly influenced by fishing success and reservoir levels. During the drought of 1990-1991, use numbers were significantly lower than previous or subsequent years.

It is estimated that dispersed camping and recreation uses mimic the much larger recreation visitation numbers for Gerber reservoir. In the past five years or so, the Gerber primitive campsites (hunter camps) have seen increased visitation on weekends, probably due to increased knowledge of their location/amenities and lack of use fees.

The charging of user fees for camping since the mid-1980s and for day-use since the mid-1990s has, in general, been well received, with few visitor complaints. This may be due to increased visitor services and maintenance, as provided by campground host whose expenses are funded by these user fees.

The current management of developed recreation facilities is receiving positive feedback from the vast majority of visitors. A wide range of recreation opportunities is available within the watershed, from primitive dispersed and primitive developed sites to fully developed facilities. Many opportunities are available for those seeking solitude (on weekdays and outside the primary use seasons). For those who do not want to pay visitor use fees, many less-developed sites are available, and the main Gerber campgrounds are free after the primary use season.

Of critical importance to maintaining a diverse recreation program is continued funding for planning, operations, facility maintenance, and visitor services. The continued use of volunteer camp hosts for visitor services and day-to-day maintenance is risky. While the BLM has been successful in attracting quality volunteers for assistance, a seasonal park ranger is needed to manage their activities and provide additional assistance and back-up for problem visitors. Additional funding for replacement or new facilities will also be needed in the near future for such items as boat ramps and docks, Miller Creek trail, and a proposed horse camp area.

Additional efforts in developing and signing motorized and non-motorized trails are needed to meet an existing demand. At the same time, increased efforts are needed to protect such areas as sensitive wetlands, meadows and cultural sites from OHV use.

The potential for raising the level of Gerber Dam (and Gerber Reservoir) by the BOR could make for major changes to existing recreation facilities and usage. The current level of recreation facility development, recreation setting and use levels and visitor needs must be considered if replacement facilities are to be provided.

Cultural Resources

A pattern of resource extraction by humans from prehistoric times into the modern age characterizes the Gerber/Willow Valley watershed. Only the intensity and focus of the extraction has changed. Before Euro-Americans arrived, the Modoc followed a hunting-fishing-gathering, seasonal-round subsistence strategy that left little more than lithic debris, rock rings, and cairns on the landscape. With the arrival of Euro-Americans and their complex technologies, the landscape was transformed (roads, fences, earthen dams, buildings, etc.).

Unfortunately, prehistoric and historic cultural remains are a non-renewable resource that are in danger of being lost forever. Many of the prehistoric sites within the watershed analysis area have suffered significant vandalism and looting, especially village sites. Damage occurs whenever artifacts are disturbed. Damage can be caused by unintentional ground disturbance, such as off road vehicle use through prehistoric sites. Intentional disturbance, such as unauthorized excavation and surface collection occurs as well. Sadly, rock art within the Gerber/Willow Valley watershed has also been intentionally altered (Figure 5-4). Once disturbed, Native American heritage and scientific and educational values are lost forever.

Figure 5-4. A damaged rock art panel in Barnes Valley.

Often artifact collecting is part of a commercial business. Artifact collecting from federal lands was made illegal through the Antiquities Act of 1906 and the Archaeological Resources Protection Act (ARPA) of 1979.

Federal land management projects also have the potential to disturb cultural resources. Such ground disturbing projects include fence construction, range improvements, timber harvests, and fuel reduction treatments. However, federal agencies are mandated under Sections 106 and 110, of the National Historic Preservation Act of 1966, as amended through 1992 (NHPA), to prevent or minimize project damage to cultural resources. Section 106 requires that all federal agencies "take into account the effect of the undertaking on any" cultural resource. Section 110 establishes the National Register of Historic Places (NRHP) program that ensures that historic properties are identified, evaluated, and nominated to the National Register, a register of historic properties maintained by the National Park Service. Thus, cultural resource inventories are designed to locate, record, and protect cultural resources.

Recreation and grazing activities can damage sites, but to a lesser degree. Recreation use in the area was extremely limited until the development of logging roads and vehicles that could travel on the primitive roads early in the 20th century. Recreation use remained limited until WWII, with the advent of more rugged off-highway vehicles. As road conditions improved and disposable incomes increased, more people began to use the area for camping, fishing, and hunting. Gerber Campground and the scattered primitive campsites were originally developed in the 1960s by the BLM. Recreation use has remained fairly steady over the past decade, with an estimated 15,000 visitor use days annually in the Gerber area.

Additional impacts include natural processes such as weathering, erosion, wildfire, and earthquakes. For example, before the construction of the dam on Miller Creek, the area that is today Gerber Reservoir was a vast wet meadow supporting abundant root crops. The bed of the reservoir was inventoried during the drought of 1981 and a large number of sites were discovered. The inventory revealed that sites found along the shoreline were being damaged by wave action and ice rafting (Cannon 1984 and 1985). This affects all the sites below or at the high water mark due to varying changes in water levels from year to year and season to season. However, an inundated site may be protected because the water creates an oxygen deprived environment and removes it from the reach of artifact collectors. Although many of the natural processes are unavoidable, some effects may be reduced. For example, fuel treatments can reduce the effects of catastrophic wildfires.

Subsistence Hunting

The Klamath Tribes traditionally and presently subsistence hunt for mule deer along the northern boundary of the Gerber/Willow Valley watershed.

STEP 6. MANAGEMENT RECOMMENDATIONS

Step 6 provides recommendations based on the analysis presented in the previous 5 steps. This step also identifies monitoring activities that are needed in association with these recommendations. Data gaps and limitations of the analysis are also documented. Recommendations are designed to identify management activities that are responsive to needs identified in this watershed scale analysis. Specifically, management actions which address differences between current and reference conditions, where there is a need to provide restoration, maintenance, or protection of ecosystem components in order to sustain the health and productivity of natural resources. Any actions or projects, which utilize the information presented in this Watershed Analysis, will be analyzed on a site-specific basis by an interdisciplinary team and will include both public involvement and disclosure of decision as prescribed by the National Environmental Policy Act (NEPA).

I. Watershed and Aquatics

<u>Uplands/Soils</u>

Generally the greatest erosion risks are on sites where ground vegetation associated with high infiltration rates has diminished, such as overstocked woodland and forest plant communities. In these overstocked communities the historic balance between overstory and understory vegetation is out of balance. The density of the overstory limits the extent and distribution of erosion limiting ground vegetation. Crown fires in overstocked forest and woodlands also significantly increase erosion rates from 0.02 tons per acre sediment transport to 1.91 tons per acre (WEPP, 2001). Current prescribed under burns in the Gerber drainage have begun to reduce the erosion risk. Yet there are more areas to thin to reduce the risk from dense canopies that volatilize most of the soil's nitrogen during hot wildfire burn (Biswell, 1989, Debano et al 1998).

Forest openings and abundant grass undergrowth is a key to sustaining site functions. For example the ground vegetation with abundant Idaho fescue, *Festuca idahoensis*, is a key component of three ecological sites: Pine Fescue Bottom, Pine Sedge Fescue and Pine Mahogany Fescue (Soil Survey Staff, 2002). To better estimate local erosion risk infiltration was sampled at sites with vegetation conditions recorded on the *"Rangeland Inventory – Ecological Status Worksheet"* forms during the 1997-98 ESI survey that accompanied the soil survey. In the comparison of infiltration and vegetation, vegetative cover including late seral forest shrub species is associated with higher infiltration as shown in Table 4-1. These local findings are consistent with WEPP (2001) erosion technology findings in reference forest and rangeland vegetation. But in a tour across the Gerber drainage, the forest openings or the current underburns are not effective enough to recover or sustain the Idaho fescue grass cover and forest shrubs.

To limit erosion, open forest structure along roadways should be developed and sustained with grass-water-way understories. Since the 1930s, grass-water-ways have been established as the most effective sediment and nutrient traps. And on most landscapes, roads have been recognized as the most effective erosion transporting system. So the effects of roadways can be minimized by grass-water-ways. Sustaining an open forest structure for about a quarter to half mile on each side of a road should also facilitate wildfire control. And established grass-water-ways along roadways may reduce the common post fire emergency treatments of cleaning road ditches and replacing culverts. Similarly, sustaining an open forest structure along meadow edges enhances fire control and slows water to limit gully erosion after wildfires.

Currently, biological functions of ground vegetation in forest openings have diminished in the Gerber drainage. Forest openings are needed to accommodate well-rooted undergrowth for effective erosion control. Canopy openings would slow the wind for improved snow catch (Church 1912, Sutterlaund, 1972).

Emphasize erosion limiting ground vegetation in the Ponderosa Pine and Pine Associated types by returning of a portion of the stands to a single-story LOS (Late/Old Structure) condition as identified in *Step 6 - Forested Vegetation*. Mid seral ponderosa pine stands should be thinned enough to allow enough gaps among forest trees so shrub components that contribute to higher infiltration rates can survive wildfires. Some of the best infiltration gains are apt to occur in white fir climax stands, with LOS components.

To limit soil erosion in woodlands and rangelands focus attention on ecological condition as identified in step 6 non-forested uplands for vegetation– maintenance or improvement. Generally the true Juniper woodland rangeland ecological sites are too open to carry a crown fire and shallow and rocky soils generally maintain junipers spacing. Still some thinning is prudent, especially where the fire can be conducted into the adjacent forest.

Hydrology

Past and ongoing management impacts to hydrologic processes should be addressed. Actively restoring the structure and composition of altered vegetation communities would make more water available for plant growth, aquifer recharge, and/or streamflow. In addition, improved understory conditions in restored vegetation communities would result in higher infiltration rates and reduced runoff. In juniper treatment areas with degraded understory vegetation, high proportions of bare ground, and shallow soil, it may be desirable to leave some whole trees or "lop-and-scatter" some material. This material could be left on site for 1 to 4 years (in order to detain surface runoff and contribute nutrients) and then burned.

As they are identified and as opportunities develop, roads that divert surface or groundwater flow paths or deliver road runoff directly to stream channels should be modified. Appropriate road treatments could include obliteration, decommissioning, road improvement (retrofitting or adding road drainage features), or road realignment. The overall road density should be reduced in subwatersheds that have more than 2.5 miles of road per square mile or that been affected by increases of more than 15 percent in drainage network length (*Step 3 – Current Conditions*).

As opportunities develop, efforts should be made to identify instream flows needed to protect water quality and sensitive uses. Subject to cooperation with reservoir managers, land owners, and /or the holders of water rights, creative solutions to water allocation issues should be sought.

DATA GAPS:

- The understanding of the relationships between juniper encroachment and hydrologic processes is incomplete. Additional quantitative information is needed to better quantify the benefits of juniper treatment on infiltration rates and water availability. This data gap should be filled over time through monitoring of juniper treatment projects and collaboration with scientists investigating these issues.

Stream Channels

Steps should be taken to ensure that streams are connected to their floodplains. This is key to maintaining and restoring summer baseflows, riparian vegetation, water quality, and fish habitat.

There are three main phases of stream channel adjustment that are evident in the analysis area. Potential restoration responses to this sequence are summarized below and presented in more detail in Table 6-1. Monitoring and detailed analysis specific to candidate restoration reaches will determine the scope and type of restoration activities.

Rosgen C and E streams that have not incised into associated floodplains or wet meadows should be managed to maintain vertical and lateral stability. These streams are generally in Proper Functioning Condition or Functional-at-Risk. As described in Step 3, the process of incision becomes self-perpetuating once it has progressed past a certain point. For that reason, every effort should be made to prevent accelerated incision in perennial and intermittent streams that are beginning to widen and downcut. Management should focus on maintaining bank stability (adequate riparian vegetation and rooting strength) and address watershed issues that lead to increased peak flows.

In Rosgen G and F stream types, the formation of new (albeit lower elevation and more narrow) floodplains that can interact with the current stream channel should be allowed to happen over time. In priority areas, it may be appropriate to reshape streambanks or realign lengths of stream channels to accelerate the geomorphic processes that create new floodplains (bank erosion, meander belt development, increased sinuosity, etc.). It may also appropriate to place juniper trees in some streams to accelerate channel widening and favor the formation of pools.

In streams that have formed or are in the process of forming "new" Rosgen C and E channels it is imperative to encourage the development of deeply rooted vegetation communities that will help capture sediment and maintain bank stability. Recommended management in these areas is similar to that described above for un-incised Rosgen C and E channels, although newly formed channels may be more responsive to livestock grazing. Gentle bank slopes that develop over time would reduce bank sloughing, slow drainage of terrace soils, and provide improved beaver habitat.

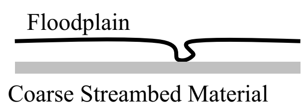
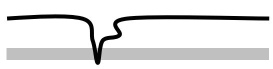
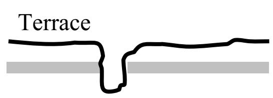
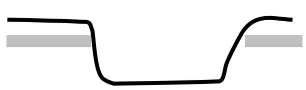
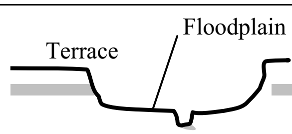
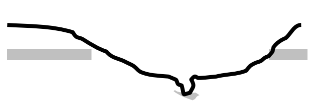
Other recommendations for management of stream channels include:

- Where fill material has been placed across floodplains to build bridge approaches (such as at Pitch Log Creek, Barnes Valley Creek, Long Branch Creek, and Rock Creek), "floodplain relief culverts" should be installed. These culverts would be placed at the level of the floodplain and would allow water on the floodplain to pass under the road. This would reduce scour downstream from bridges and would allow enhanced floodplain inundation.
- Reintroduction of beaver should occur in selected areas once sufficient vegetation exists to support beaver populations (see Wildlife sections). Low gradient stream reaches with fine textured soils would be good areas for reintroduction (Gurnell 1998). This would benefit stream channels, baseflows, and riparian vegetation by providing local grade control and energy dissipation (beaver dams), forcing water into floodplain aquifers, and prolonging the period of inundation. Channel and vegetation response should be monitored in these areas.
- Construction of livestock exclosures as recommended in the *Human Uses-Grazing* section. Use monitoring information, riparian mapping, and stream surveys to determine if exlosures may be appropriate in other areas.

DATA GAPS:

- Stream surveys should be conducted on those streams not already surveyed by ODFW, BLM, or USFS staff. These include Ben Hall Creek, Rock Creek, East Branch Lost River, and other streams on USFS and private land. This information would be used to assess habitat quality and develop restoration projects.

Table 6-1. General management considerations for incised stream channels.

Adjustment Phase (Rosgen Stream Type)	Conceptual Diagram	Summary of Management Recommendations	Priority		
			No Fish	Fish-Bearing	Special Status Fish-Bearing
1. No Incision **(C or E)**		Maintain riparian vegetation and bank stability	**H**	**H**	**H**
2. Early Widening and Incision **(C or E)**		Restore riparian vegetation and bank stability through passive management; Establish grade control; Address conifer encroachment	**H**	**H**	**H**
3. Incision **(A or G → F)**		Construct new channel or Allow to widen into F channel and develop new floodplain (depending on management objectives); Address conifer encroachment	**L**	**M**	**H**
4. Meander Belt Development **(F → C)**		Allow (or accelerate) bank erosion to create meander belt and new floodplain; Encourage riparian vegetation establishment; Address conifer encroachment	**L**	**M**	**H**
5. New Floodplain **(F or C → C or E)**		Minimize impacts to riparian vegetation and bank stability; Reshape banks to reduce sloughing; Address conifer encroachment	**M**	**M**	**H**
6. Convex High Bank Profile **(C or E)**		Maintain riparian vegetation and bank stability	**M**	**H**	**H**

Riparian Vegetation

Generally the greatest wetland loss risk is in overstocked woodland and forest plant communities that consume water that historically supported the wetland. Dam building has also inundated prior wetlands as identified in Step 3. Still, water flow to the current wetland areas can be improved with more recharge and less water consumption by transpiration in the overly dense woodland and forest vegetation. Currently forest openings that aid recharge have diminished in the Gerber drainage. Forest openings are needed to accommodate well-rooted undergrowth for effective recharge and to slow the wind for improved snow catch (Church 1912, Sutterlaund, 1972). Reducing woodland and forest density is needed to sustaining the water needed for wetland functions.

Playas, which characterize the ecoregion, depend on the recharge from a thrifty forest. To limit transpiration to historic pine forest condition, pine density may be managed to 14 to 20 trees per acre. While in the Juniper woodlands the density should be less than 9 trees per acre. To limit direct wetland loss, the priority treatment areas are areas along playas, wetlands and meadows, where conifers are encroaching on to riparian areas. Forest management is needed to limit the encroachment of woodland and forest trees on to wetland and riparian plant communities. Along riparian areas cultural practices should focus on promoting riparian forest of cottonwood or aspen or relevant riparian plant species. With attention to transpiration there should be sufficient recharge to sustain the wetlands.

Maintain or improve ecological condition in riparian and wetland vegetation in ways similar to the processes identified in step 6 non-forested uplands vegetation. The newly available ecological sites, soil survey maps and descriptions as well as riparian scorecards should facilitate tracking riparian recovery or investments in many areas. Yet along narrow floodplains and stream reaches maps of riparian types and their habitat conditions would improve the resource infrastructure for project planning and restoration.

Over time, Proper Functioning Condition assessments should be conducted for wetlands in the area. If physical modifications (roads, stockponds, etc) are found to be impairing wetland function, interdisciplinary efforts should be made to identify and implement potential restoration projects (road realignment or modification, stockpond filling, etc).

Active restoration of riparian vegetation is needed along select stream banks. Many of the streams in Gerber are associated with silt and clay floodplain material. Yet gravel bar reaches do occur for example, Pitch Log Creek above Barnes Valley road. The basalt streambed is holding the grade and sand occurs in pools among the basalt bed. Yet the vegetation is failing to catch sediment and build stream banks. Still, willow recovery or restoration is possible with a nurse willow such as sand bar willow, *Salix exigua.* The sand bar willow is rhizomatous, so it can begin the gravel bar formation needed to promote the growth of Geyer's willow, *S. geyeriana* and Lemmon's willows *S. lemmonii*, which occur down stream on Pitch Log Creek.

DATA GAPS:

- Location, extent, and distribution of existing riparian types and their habitat conditions.
- Location, extent, and distribution of stream incision associated with riparian habitats.
- Water temperature trends associated with changes in riparian vegetation, channel shape, and streamflow are needed to identify where stream temperatures can be effectively reduced on the 303(d) listed streams to their natural thermal potential.

Water Quality

As discussed throughout the document, land management affects water temperature through changes in riparian vegetation, channel shape, and streamflow. Management actions of the BLM and USFS can directly affect vegetation and channel shape, and can indirectly affect streamflow (as discussed in the *Hydrology* sections). In order to protect and restore the riparian and channel features conducive to reduced water temperatures, the BLM and USFS should:

- Riparian management areas (i.e., riparian reserves) around all streams (excluding ephemeral streams), lakes, and wetlands should be managed to restore and maintain habitat and ecological processes in riparian areas and streams. A combination of active and passive ("hands-off") management should focus on protecting and restoring riparian vegetation, channel processes, and water quality in accordance with current agency policy and guidance.
- The widths of riparian reserves should be based on natural and ecological boundaries that are relevant to restoring and maintaining riparian resources (Table 6-2).
- Reduce stream temperatures on the 303(d) listed streams to their natural thermal potential commensurate with stream and riparian area ecological potential.
- Maintain the riparian areas across the analysis area so that every stream (whether 303[d] listed or not) is at its lowest potential temperature consistent with ecological potential.
- Manage livestock grazing within allotments in riparian areas to ensure that channel and vegetation conditions are improving where needed.
- Improve aquatic habitat in areas of severe degradation through treatments such as the placement of large wood in channels and recovery of riparian vegetation on unstable streambanks. Vegetation will recover by regrowth (passive restoration) and planting of riparian species along listed streams.
- Work cooperatively with reservoir managers, land owners, and/or water right holders to identify opportunities to increase baseflow in streams downstream from reservoirs.

Many of the recommendations listed above would also lead to reductions in delivery of fine sediment to streams. To complement those actions and address upland sources of sediment, the BLM and USFS should:

- Manage the National Forest and Bureau of Land Management road system to minimize sediment yield and runoff, and minimize delivery of sediment and runoff to streams.
- Restore the understory grass and shrub components to upland vegetation communities, thereby increasing infiltration rates and reducing the extent of bare ground.

The BLM and USFS will cooperate with the state DEQ and other water quality management agencies and with the Federal EPA throughout the TMDL development process, and should continue to address 303(d) listed waters by implementing the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Action Section 303(d) Listed Waters (May 1999).* Among other actions, this will include validation of listed water bodies, assessment of water quality impairment, and development of sufficiently stringent management measures to ensure attainment of beneficial uses.

The Water Quality Restoration Plan (WQRP) will be the vehicle for implementing, monitoring, and evaluating the effectiveness of management actions. Plans will be developed concurrently or in advance of TMDLs that will be developed by the states. This watershed analysis will provide the foundation for assessing the capabilities and limitations of the Gerber Reservoir and Upper Lost River watersheds, and will provide context for the TMDL and the WQRP. In addition, this watershed analysis provides a discussion of technical considerations needed for more rigorous water quality assessments. Finally, the management recommendations described in this watershed analysis are oriented towards maintaining and restoring water quality and will be incorporated in the WQRP.

DATA GAPS:

- A thorough assessment of stream shading (should be conducted on public lands throughout the analysis area. This assessment should quantify the proportion of shade contributed by vegetation and topography, as well as the variability of shade between different stream types and channel widths. This information would be used to develop the Total Maximum Daily Load and monitor riparian vegetation treatments.
- Stream surveys (recommended in the Stream Channels section) would be of use in developing models of potential water quality improvements.

Table 6-2. Riparian reserve types and widths for public lands in the analysis area

Riparian Reserve Type	Reserve Width (for each side of streams/wetlands)
Fish-bearing streams	At a minimum, the reserve width will include: ▪ Slope distance equal to the height of two site potential trees (240 feet); or, ▪ The stream channel and the area extending to the top of the inner gorge; or, ▪ The area extending to the outer edges of riparian vegetation; or, ▪ The 100-year floodplain; or, ▪ The extent of unstable or potentially unstable areas, whichever is greatest.
Perennial non-fish-bearing streams and Intermittent (seasonal) non-fish-bearing streams and Constructed ponds and reservoirs and Wetlands greater than one acre	At a minimum, the reserve width will include: ▪ Slope distance equal to the height of one site potential tree (120 feet); or, ▪ The stream channel (or waterbody/wetland) and the area extending to the top of the inner gorge; or, ▪ The area extending to the outer edges of riparian vegetation; or, ▪ The 100-year floodplain (for streams) or the extent of seasonally saturated soil (for waterbodies and wetlands); or, ▪ The extent of unstable or potentially unstable areas, whichever is greatest.
Wetlands less than one acre and Unstable or potentially unstable areas	At a minimum, the reserve width will include: ▪ The wetland and the extent of seasonally saturated soil; or, ▪ The area extending to the outer edges of riparian vegetation; or, ▪ The extent of stable or potentially unstable areas, whichever is greatest.
Lakes and natural ponds	At a minimum, the reserve width will include: ▪ Slope distance equal to the height of two site potential trees (240 feet); and, ▪ The body of water or wetland and the area to the edges of riparian vegetation; ▪ The extent of seasonally saturated soil; ▪ The extent of unstable or potentially unstable areas; whichever is greatest.
Springs	Reserve widths vary according to the size of the associated wetland (see above).

Habitat for Aquatic Species

In the aquatic habitat sections, five parameters were selected as potential limiting factors and indicators of aquatic species habitat function. Recommendations and data gaps are identified for each of these selected parameters.

Selected Habitat Parameters:

- Fish passage and distribution
- Stream temperature
- Spawning habitat
- Habitat complexity (amount of large woody debris and number of pools per mile)
- Exotic Species distribution and abundance

Data gaps were identified based on the need for additional information to make science based decisions regarding aquatic habitat management and requirements. The following items should be considered as recommendations for future study and project development:

Recommendations
For redband trout and suckers, having multiple subpopulations requires that multiple and diverse areas provide spawning and, rearing and over-wintering areas. Fish passage to cold-water refugial areas is necessary for trout during periods when reservoir conditions are lethal (such as extended drought leading to low lake levels). Conversely, when stream conditions are poor (such as dry channel or low flow due to annual short term drought), reservoirs become the refugial summer habitat for fish. For these reasons, it is recommended that stream and reservoir refugial areas be identified and that all migration barriers be removed where possible. To the extent that restoration of road drainage function, upland vegetation, and riparian vegetation can achieve increased base flow and improved hydraulic function, they will contribute to meeting these refugial requirements while simultaneously reducing the burden that flow and lake level recommendations would impose on other water users.

DATA GAPS:

- Location and existing habitat and migration barriers, especially as they relate to existing flow regimes and man-made barriers on private lands. Many of the perennial, spring-fed streams that could provide refugial habitat are in private ownership.
- Population viability requirements-that is - How may sub-populations and of what size are required for population viability?
- Existing population size, trends, and distributions.
- Further exploration of limiting factors- i.e. a comprehensive limiting factors analysis for suckers and trout populations.
- Specific refugial areas and specific flow level and reservoir level recommendations for refugial areas.
- Genetic studies of suckers and trout detailed enough to provide insight to geographic origins, similarities and differences between adjacent populations, amount of genetic variation within populations (genetic fitness), and the degree of hybridization (as applicable to the species).
- Potential for Willow Valley Watershed to provide viable trout and sucker populations.
- Recruitment source(s), migration patterns, and life history requirements of suckers and trout in Miller Creek.

Stream Temperature

The analysis showed that stream temperature was a potential limiting factor for the distribution and abundance of redband trout in the early spring during spawning and again throughout the summer. Efforts to reduce thermal inputs to stream should focus first on known spawning and rearing areas and then on the aforementioned refugial areas.

Recommendations
Improved stream temperatures, that is, reducing the rates of warming, can be achieved by reducing solar inputs from radiation and convection. In the uplands, processes that increase base flow conditions (increased infiltration and groundwater recharge) are the primary mechanism for decreasing thermal increases in the summer. In the riparian areas, base flows are improved by increasing water storage in floodplain areas and increasing floodplain connectivity to stream network. Furthermore, efforts to reduce bank instability and stream width/depth ratios will reduce solar radiation and convective inputs, reduce evaporative loss, and increase the effectiveness of riparian vegetation in providing shade.

DATA GAPS:

- Model of stream temperature dynamics in Miller Creek to determine minimum flow requirements for achieving temperature standards. Explore stream channel rehabilitation options to improve riparian vegetation and reduce width to depth ratios.
- Use standard thermal input models to determine the potential of 303d listed streams to achieve state mandated temperature standards. Consider relevant redband trout thermal tolerance literature in development of site-specific temperature objectives.
- The existing stream temperature record is discontinuous and spatially fragmented. Continue to collect stream temperature data following established protocols to fill data gaps, particularly in potential trout-bearing streams.

Spawning Habitat
This analysis looked at the percentage of fines in gravel riffles and the percent gravels in riffles to determine whether streams were providing quality spawning habitat. The quality of the data and the lack of consistency in the methods used severely limit its utility in making management recommendations. Further study using appropriate methodologies is warranted. It is clear that from anecdotal information and the stream habitat survey data that, in some stream reaches, high quality spawning gravel beds are lacking. The role that watershed processes such as road runoff and bank erosion play and how they interact with existing climate and geology is not clear. However, because many riparian areas and floodplains are dominated by fine grained material, it is reasonable to assume that management aimed at reducing fine sediment delivery to streams will positively affect the stream substrate compositions by reducing the relative percentage of fines in the bed material.

DATA GAPS:

- Bulk sieve analysis of riffle streambeds following established protocols in selected streams to determine actual substrate composition.
- A quantitative inventory of the degree of embededdness (armoring) in potential sucker and trout spawning areas.
- Extent and contribution of stream bank erosion to overall suspended and bedload sediment supply.
- Explore other pathways (e.g. roads) of sedimentation and determine their contribution to fine sediment supply in streams.
- Assessment of Miller Creek spawning habitat and possible hydrologic and geomorphic restorative actions that could improve the availability of spawning habitat for suckers and trout.

Habitat Complexity (amount of large woody debris and number of pools per mile)
There was high variability among reaches in terms of large wood and pool frequencies. With some exceptions, most reaches had values nearly equal to or greater than the reference condition values. One of the observed problems with this analysis was that many of the reaches, especially Miller Creek, may have used an inappropriate stream width variable to calculate reference values. Therefore the reference condition may have been underestimated.

The variable pool width /maximum pool depth ratio is a dimensionless ratio that indicated simplified habitat conditions throughout the watersheds when compared to both the Gerber/Willow Valley reference conditions and values suggested by recent literature (Quigley et al, 1997).

Recommendations
In stream reaches lacking complex habitat features (deep pools, woody debris jams, or boulders), add structure where data supports that condition is under potential and material is available such that it is economically feasible to enhance aquatic habitat. Adding stream roughness has multiple benefits including reduced average velocity, retention of spawning gravel sediment, increased frequency of overbank flow,

increased habitat complexity, increased relative proportion of pool habitat, increased maximum pool depth, and attenuation of peak discharge.

Stream channel morphological features such as pool width/depth ratios, maximum pool depth, and sediment retention can all be improved by protecting streambanks from physical breakdown such as trampling and shearing. Development of a fully functional riparian plan community along streambanks will provide the stability needed to maintain pool features and low width to depth ratios.

Vertically incised streams in the watershed warrant special attention. Each situation needs to be analyzed site specifically to determine the proper management response. The perturbations that caused the initial degradation should be addressed before attempting rehabilitation. Every opportunity to recover streambed elevations to access former floodplains should be pursued to the extent practical. Reconnecting streams with their former floodplains will increase storage capacity, restore base flows and improve habitat quality. The rehabilitation of incised channels will also address bank erosion and sedimentation.

DATA GAPS:

- Inventory a suite of representative reference conditions for stream morphology and habitat features for the Gerber/Willow Valley physiographic province. In particular, pool frequency/spacing , width/depth ratios, and entrenchment ratios are needed to better understand existing departure from the potential condition and provide an analogue for rehabilitation design.
- Assess the extent and potential to rehabilitate laterally and vertically incised stream channels in the watersheds.
- Investigate the potential to reconstruct channel morphology in portions of Miller Creek to fit the current hydrologic regime. Objectives of channel reconstruction might include creation of spawning habitat, increased width of riparian areas, and reduced width/depth ratios.

Exotic Species Distribution and Abundance

The establishment of exotic fish and bullfrogs in the watershed is largely the result of man-made reservoirs, which provide abundant slow and still water habitat. Although the extent that these exotic species have displaced native species is not well understood, in some locations native species appear to coexist with the exotic species (Gerber Reservoir). Willow Valley Reservoir appears to contain virtually all exotic fish species.

Recommendations

For the smaller reservoirs in the watershed, management options for the temporary exclusion of exotic fish includes dewatering. This should be considered when either a particular fish population (or bull frog population) is known to be causing harm to native species or the species composition and relative abundance is undesirable from a recreational fishery standpoint. For example, overpopulation of yellow perch in Upper Midway reservoir is thought to have caused a decline in the size and abundance of crappie and largemouth bass. Through cooperative efforts with local sport fishing organizations and ODFW, a management strategy should be developed for these reservoirs. It should address factors such as impacts to native species, illegal transportation and stocking of fish, and re-stocking with desirable fish assemblages that are conducive to establishment of a quality sport fishery.

DATA GAPS:

The role of bullfrogs, largemouth bass, and yellow perch in displacement and predation of native species such as Western pond turtle, redband trout, and Klamath sucker species.

II. Vegetation

Forested Uplands

The watershed should be managed to restore forest stands to approximate the historic range of variability. This includes reducing elevated stocking levels, reducing juniper encroachment, reducing white fir encroachment, and reducing fuel accumulations. This would lead to healthy stands that are more able to resist the episodic events that lead to stand replacement.

In the Ponderosa Pine and Pine Associated types, emphasize return of a portion of the stands to a single-story LOS (Late/Old Structure) condition. In doing so, retain the existing LOS component. Mid seral ponderosa pine stands should be thinned to favor the development and protection of large diameter ponderosa pine. This will also encourage development of a more diverse shrub and herbaceous understories. Heavily thin under existing large diameter old growth pine to reduce stress and maintain them as a stand component. Salvage logging of insect and fire-killed trees, and trees killed by other agents, should be done where other resource values can be protected. Salvage would remove excessive fuels, utilize material for commercial use, and prepare stands for tree planting and other regeneration treatments.

Where white fir climax stands occur, leave all LOS components. Unless evidence of severe overcrowding is present, these stands will most likely survive for long periods and adequate large tree replacements will enter the stands from the understory.

Utilize understory thinning in areas that are above historic density levels. Where conifers have become established in aspen stands, an opportunity exists to cut the conifers in arrays of barriers to grazing that will most likely allow sprout reproduction to regenerate. Remove competing conifers from aspen stands. If regeneration is required, stimulate aspen clones to regenerate with prescribed fire or mechanical means. Protect young aspen by providing slash barriers, pasture management, or exclusion fencing as a last resort. Remove or reduce conifers from areas of encroachment, including dry meadows and riparian areas. Retain individual aspen having old carvings.

Identify declining black cottonwood clones. Analyze the need to restore the hydrologic integrity to support cottonwood restoration. Establish new areas of cottonwood utilizing material from the nearest existing clone. Focus on an adaptive management approach when manipulating LOS mixed conifer stands on low energy aspects. Focus management efforts on those eco-tones where ponderosa pine is already present to some degree. These fringe pine sites often require some culturing efforts to encourage the development of ponderosa pine.

Early Seral Stage Stands

All Plant Associations
In this watershed, early seral stands are primarily products of regeneration management activities, which required artificial or natural regeneration practices that established the current stocking levels. Plantations consist of mostly ponderosa pine from seedling to sapling size trees, planted at 6 to 12 foot spacing, depending on landowner. Various levels of residual trees were commonly left within these units. Tree ages range from 3 to 25 years. Stocking varies, but most sites are carrying in excess of 250 to 500 trees per acre. Most plantations less than five years old receive periodic stocking exams and animal damage control treatments.

Manage these stands so they will continue to develop into mid seral stage structures. Favor ponderosa pine to maintain growth and vigor to grow into the later seral stages and reduce risk of mortality from bark beetles. At that point, more options can be considered.

Mid Seral Stage Stands

Ponderosa Pine Plant Associations
In the next two or three decades, present early seral plantations will begin to grow into this stand structure. A full spectrum of these stands occur, from early-mid, dense post and pole stands, to late-mid stands that are beginning to take on LOS characteristics. The presence of ladder fuels is a concern in many stands. Many of these stands are exhibiting the symptoms of various forest health problems such as mountain pine beetle, and heavy mistletoe infection, while others are healthy; having been precommercial thinned and underburned. Almost all these stands were created in response to understory reinitiation from fire prevention and various degrees of removal of the reference period pine overstory. Many of these stands are also occurring as trees encroach onto meadows, aspen stands, and riparian areas.

As with the early seral stands, management should focus on development of a portion of these stands to grow into healthy LOS structures. For these fire dependent ecosystems, maintenance of the high canopy and controlling understory reinitiation are the two fundamental management concerns. The mid seral stage is where the high canopy becomes defined. Historically, frequent fires burned and thinned trees, defining the spatial distribution of the trees that make up the canopy. This distribution tended to be clumpy with occasional patches of younger cohorts. Active management can help “set the stage” for mid seral structure to grow into LOS. Opening up the canopy can trigger understory reinitiation, but reintroduction of prescribed underburning can control this. Without treatment, these stands become susceptible to mortality agents before they become LOS or will become high risk in the early-late stages.

Mixed Conifer Plant Associations
These stands occur on Forest Service and private land; no mixed conifer stands have been identified on BLM lands. These stands tend to be the results of overstory removals where the large ponderosa overstory was removed from even-aged advanced regeneration of white fir or ponderosa pine. Many of these stands were precommercial thinned for the fast growing white fir to grow to a target size, when a clear-cut harvest would have then been prescribed. Meandering, ponderosa plantations were created within many of these stands when the overstory removal and mistletoe cleaning would leave portions understocked. The two main objectives of such management were to conserve scarce high elevation ponderosa pine seed and to capture future volume growing on the fir.

The drought of the early 1990’s triggered extensive mortality in these stands. Many of the fir stands suffered mortality or top kill from fir engraver beetle. Annosus root disease pockets also increased. Pure white fir stands, stressed by drought, have little or no resistance to these mortality agents.

Manage stands so that a stable species distribution becomes established. Favor any existing pine while replacing a portion of the white fir with ponderosa pine. Develop a multi-aged structure to favor shade intolerant species. Few stands will benefit from culturing the fir component; stocking is usually adequate for fir. Encourage pine regeneration.

Late or Old Seral Structure (LOS) Stands

Ponderosa Pine Plant Associations
The one main criterion that makes these stands LOS is that large trees (>21"DBH) are considered common across the site. Common can mean as few as five or six large trees per acre. Other attributes connected with LOS function (i.e. snags, large woody debris, canopy layers, etc.) vary within stands and between stands. The presence of certain attributes may make a stand function as LOS with only a few large trees per acre present (Hopkins 1993). These stands vary in amounts of management activity that have occurred in them. Most stands have had some overstory removed in them. Many stands have undergone prescribed underburning. Most stands have had their LOS structures degraded.

Under current Forest Service management direction, LOS structures are to be maintained and protected. Management should cause "No Net Loss of LOS" (Eastside Forest Plan Amendment 1994). The management of aggregations of stands that form larger blocks of LOS is critical. Objectives for management are similar to those of the mid seral pine stands. For these fire dependent structures to persist, maintenance of the high canopy and controlling understory reinitiation is critical. For many stands, fire has been used to control fuels build-up. This tool should continue to be used to reduce unwanted understory conifers. Understory competition is the most immediate hazard to LOS stands. Dense understories tax the site's growing potential, as well as providing the ladder fuels that can move ground fires to crown level, and cause stand replacement fires. For stands with few and scattered large trees, management should try to maintain those trees and focus on development of the mid and early components of that stand.

Many stands can begin restoration with prescribed underburning alone.
Consider LOS restoration when:

- Dominant and codominants are ponderosa pine >18 inches DBH, > eight per acre with more soon to grow into that class.
- Stand is overstocked, due in large part to the lower and middle strata densities.
- High canopy is relatively healthy and not actively declining.
- Stands are adjacent to blocks of functional "old growth" and an opportunity exists to enlarge that block through treatment.

Stands with highly decadent overstories should be low priorities to restore. Priorities should focus on stands that will respond to density control.

<u>Mixed Conifer Plant Associations</u>
Late and old mixed conifer occurs mainly on Fremont NF lands. White fir is much more abundant in these stands, and is often present in the overstory. On low energy slopes (north and east aspects) above 6000 feet elevation, white fir may occupy 90% of the overstory canopy and have dense fir layered below. Evidence shows long fire return intervals. These are difficult stands to diagnose due to subtle shifts in ecotones and disturbance processes. On the higher energy slopes (south and west aspects) and below 6000 feet elevation, most stands have or show evidence of having supported various levels of ponderosa pine overstory, maintained by a frequent fire regime

It is the LOS occupying the high-energy slopes where management can benefit restoring and maintaining viable LOS structure, and should considered high priority for silvicultural treatment. These stands have departed historic patterns as radically as on ponderosa pine sites.

The low energy stands pose several complexities. Where elsewhere we think of white fir as an unwanted invader, here it is a historic and persistent component. LOS on these sites is rich in diversity across multiple dimensions (species, seral stage, etc.). Dynamic disturbance processes at a small scale maintained such diversity. Today's stands are losing this diversity in seral stage distribution but at a much slower rate compared to the fire dependant stands. Any management geared to balance diversity must recognize the need. Past efforts at managing white fir with shelterwood systems have failed. Mimicking historical disturbance on these sites will require an adaptive management approach to prescribing treatments. For the immediate future, management activities within low energy stands should be low priority on any large scale.

Western Juniper and Hardwoods

<u>Western Juniper</u>
Western juniper is an invader on many pine sites were it currently grows. Elsewhere, juniper is a natural component, especially on rocky sites where natural fires seldom reached. Today, even these natural, or "old

growth" juniper sites, stocking of juniper exceeds natural levels. Use of prescribed burning is an important tool for maintenance of ponderosa pine stands where there is potential for juniper invasion. Mechanical cutting may be the only option to remove juniper from a site, possibly followed by burning.

<u>Aspen Management</u>
Quaking aspen can be found growing throughout the Gerber/Willow Valley Watershed. It grows in small, scattered populations, associated with springs, streams, or perched water tables. Aspen's main method of regeneration is asexual. When the parent clone is distressed (as when burned or cut), it sends a signal throughout its root system to begin sprouting root suckers. Throughout most of the stands lifecycle, it is a fireproofed island surrounded by lands undergoing frequent fires. As the aspen mature and fuels accumulate, fire will sweep through to trigger regeneration. Aspen tend to be relatively short-lived as an individual stem, or tree, but the clone can persist for centuries through asexual reproduction.

Being highly associated with fire to regenerate the species, aspen stands are generally in decline due to fire exclusion and conifer encroachment. Browse utilization from cattle and big game will also keep regeneration from becoming established. Once the parent clone is dead, that patch of aspen is lost. Management should seek to allow aspen stands to proliferate within the means of its ecologic processes and resource constraints. Clones with low vigor should be treated first.

<u>KNOWN DATA GAPS</u>:

- Current stand exam information including snags, down wood, disease centers and fire history,
- Stand exam data, interpreted, automated and linked to a spatial layer in ARC-INFO,
- Accurate vegetation condition class layer in ARC-INFO,
- Logging plan including economic analysis of logging alternatives for watershed, [??]
- Old growth inventory
- Detailed inventory of aspen and black cottonwood

Fire Management

<u>In Ponderosa Pine and Pine Associated types</u>:
Use prescribed fire alone and mechanical methods in combination with prescribed fire to meet objectives of reducing density and altering structure of stands.
To the extent that fuel amounts, fuel arrangement and management objectives allow, conduct prescribed fire activities at frequencies and intensities similar to the natural fire regime appropriate to the site.
Fire prescriptions should be fairly conservative until vegetative mosaics, fuel loading and continuity have been modified enough that a more liberal fire prescription is possible.
Consider landscape level treatments to create a network of areas with reduced crown fire potential.
Construction of "shaded fuel breaks" on ridges and other strategic areas reduce wildfire spread and facilitate control.
Remove ladder fuels and reduce stand density to a level at which a fire is unlikely to spread in the tree canopy.
Utilize prescribed fire and mechanical methods to protect Forest improvements (i.e. plantations, TSI areas, structures and cultural resources) from unacceptable fire effects.

Non-Forested Uplands

BLM Administered Lands

This section will make specific recommendations based on the comparison (Step 5) of current vegetation ecological conditions (Step 3) with the specific idealized plant community defined by the pertinent ecological site description (Step 4). The approved land use plan for the analysis area – the 1995 KFRA ROD/RMP – specified that "*Upon completion of an Ecological Site Inventory…ecological status related objectives will be developed…*" (Appendix H, page H-2). These are also referred to as "Desired Plant Communities" (DPC) objectives. An ideal vehicle for determining and recommending vegetation objectives is the watershed analysis process. The Step 5 section on *Human Uses - Grazing* also contains a lot of the analysis of ecological conditions relative to livestock grazing use, which has probably been the most significant agent of change on the rangeland (non-pine) plant communities in the area. The analysis in the grazing section was considered when formulating the upland vegetation objectives.

The vegetation objectives fall into two general categories – maintenance or improvement. Where conditions are thought adequate, the minimum objective would be to at least maintain the current conditions (improvement is also acceptable of course). Where ecological condition improvements are desired, a reasonable amount of improvement with a practical timeframe will be described as well as possible. In order to measure progress, a starting point or "baseline" must be defined. Baseline conditions for rangelands are currently described in one of two related ways in the analysis area. The most extensive information is the existing plant community descriptions recorded on the "*Rangeland Inventory – Ecological Status Worksheet"* forms during the 1997-98 ESI survey. There were approximately 175 of these worksheets prepared during the Gerber survey. The information recorded was not point specific, but instead describes a representative area of 1-10 acres that was picked to represent a larger site write-up area. The approximate location (within 50-100 yards accuracy) for each reading site was recorded on orthophotoquads and this information entered into the GIS database, allowing for a future rereading. The other baseline descriptions are the key area specific condition monitoring plots, which were completed at the majority of the rangeland trend plot locations in the mid to late 1990's. These are also based on ecological site descriptions and read using ESI methods. These studies are much fewer in number than the ESI worksheet write-ups but are permanently marked on the ground for precise rereading.

The general vegetation condition objectives would be as follows:

- Where conditions are currently satisfactory – typically late seral to PNC areas - the existing condition baseline will be our management objective.
- Where ecological condition improvements are desired – typically all early and most mid seral areas — the baseline will be our starting point with the objectives being some defined increase in the condition rating from the baseline within a specified timeframe.

More specifically, maintaining an area within 7 percentage points either way of its baseline would be considered maintaining current conditions. For example, if the baseline had a determined ecological rating of 58 (late seral), then any future reading(s) within the range of 51 to 65 would be considered maintenance of current conditions. In areas where ecological improvement is desired, an observed change of 8 or more percentage points up or down would be considered a significant change. A threshold range is necessary to cover both natural environmental fluctuations and study reading variations. The 7 percentage point change (14 point total range) is thought a reasonable, best estimate starting point to evaluate the ecological significance of observed vegetation change. It is based on extensive experience and observations in the analysis area. Changes outside of the range would be considered significant, though the evaluation of significance must be considered within the framework of future environmental and resource conditions, management imperatives, pertinent litigation, political environment, current science and research results, and ever changing societal desires. Changes must also be evaluated on a site-specific basis considering the actual observed changes in hand with other resource information; some changes that are significant when simply comparing the ecological rating numbers may not be so on the ground, and vice versa. NOTE: These objectives are for comparing a site condition against its specific baseline, not for comparison between sites.

In an area where improvement is needed, the timeframe in which to effect the desired change is almost as important as the amount of change itself. One broadly applied timeframe threshold is not feasible since different ecological sites have different response potentials. The ecological site-specific timeframes are noted where appropriate in the following narrative.

Yearly production can be a useful indicator of relative rangeland health, though is not used as an objective here for several reasons, as follows:

- Production is highly variable from year-to-year based on normal climate fluctuations, and appears to indicate dramatic change in ecological conditions when none is actually occurring.
- With the climate variations factored out (or averaged), gross yearly production is a good indicator of the inherent site productivity but not its ecological condition, since the production reflects all plant growth for that year, including exotic annuals and other site-specific undesirables. For example, a low mid seral and a PNC area of the same sagebrush ecological site (with the same soil attributes) will have about the same yearly production, but the plant composition will be much different. The low mid seral site will usually have a relatively high composition of exotic annuals and site atypically high amounts of sagebrush. The PNC site will have a very low composition of exotics and be dominated by native perennial grasses with sagebrush abundant, but scattered. Because of the above, the ecological rating (plant composition) is much more meaningful as an objective than production.
- Given the arid nature of the area, the inherent fertility/productivity of the soil changes little within any reasonable time period, making a production related objective impractical. If a site has suffered significant productivity loss as a result of past abuse (e.g. destructive change via overgrazing induced erosion) that site has probably passed an irreversible threshold making the change essentially permanent. If this is the case, rangeland health must be defined by the types and proportions of the plants species, with the acknowledgement that the plant community can be healthy and functional, even if production is well below previous site potential.

Priority rankings (low, moderate, high) are also suggested since not every resource problem can be aggressively pursed at any one moment. These vegetation management priorities do not take into consideration the priority of the grazing allotment (selective management categories – I, M, & C) that the area of desired improvement falls within, though that is a very important consideration when pursuing management changes. Rather, the priorities are just a relative weighting of one site against the others based on chance of significant success and the potential for irreversible ecological damage if improved management is not pursued promptly (i.e. within the next 5-10 years).

Actual vegetation change must be effected through manipulation of land management practices that are described elsewhere in this chapter (i.e. Human Uses - Grazing). Refer to other sections for a description of the actual management changes proposed to assist in maintaining currently appropriate conditions or to make appropriate progress where improvement is still needed. Where juniper treatment or control activities are suggested it is for the reduction or elimination of trees less than 100 years in age, unless defined otherwise. Trees older than 100 years, and particularly over 150 years (pre-European settlement), are considered site endemic and with few exceptions should be left.

1. **Meadow Communities** (totals 2.7% of surveyed area):

<u>Dry Meadow (0.8% of surveyed area)</u> – Most (77%) of these areas are late seral or PNC. For this ecological site, these existing condition classes would be considered proper functioning, and the maintenance of the current vegetation conditions would be an appropriate management objective. Sites on the low end of late

seral (ratings of 51-59) in lower elevation areas (<4900') could be at risk of downward trends if receiving consistent grazing use above the moderate category. These areas should be watched closely, though they are small and uncommon.

19% of this site classified as upper mid-seral and should also be monitored closely. Most of these areas do have significant amounts of several grass species (e.g. single-spike oatgrass, meadow foxtail, bulbous bluegrass, mat muhly) which are positive enhancements to overall proper functioning but do not count in the ecological ratings. Regardless of this rating issue, as a moderate priority condition objective, it would be desirable for the mid-seral areas to improve significantly (>7 percentage points rating increase) over the next 15-20 years. The one early seral site was a blown out reservoir that will not change unless the dysfunctional dike is repaired.

Juniper encroachment into these sites is generally not a problem, except on the transitional edges of these types where they blend into the drier upland communities. Juniper removal in these "edge" areas should be a high priority. Fire is a useful tool in these sites since the silver sagebrush and most of the desirable grasses are vigorous re-sprouters, though exotic annuals may be a problem if present in high quantities prior to burning.

<u>Ephemeral Lakebed (1.8% of the surveyed area)</u> – All of these areas were found to be in either PNC (92%) or late seral (8%) condition. For this ecological site, these existing condition classes are considered proper functioning and the maintenance of the current vegetation conditions would be an appropriate management objective. Juniper encroachment is not an issue due to seasonal inundation. Because of the sites wet nature, fire was a rarity and is not considered a useful management tool

<u>Semi-Wet Meadow (<0.1% of surveyed area)</u> – Where found, this rare sites management objective should be to maintain the current ecological conditions.

2. **Shrub/Bunchgrass Communities** (totals 31.4% of surveyed area)

Low Sagebrush Dominated Communities

<u>Shallow Stony 10-20" (18.1% of surveyed area)</u> – 96% of this common site is in either PNC or late seral condition. These condition classes are generally considered proper functioning for this ecological site with maintenance of the current conditions an appropriate management objective. Sites on the low end of late seral (ratings of 51-59), in lower elevation areas (<4800'), could be at risk of downward trends if receiving consistent heavy grazing use. Heavy grazing use is very uncommon in this ecological site, since the inherently low forage production and rockiness does not attract livestock. If such use were to regularly occur in an area, it should be monitored closely to ensure condition problems do not develop. In areas that are mid seral, a low to moderate priority condition objective would be to improve significantly (>7 percentage points rating increase) over the next 25-30 years. These sites have a very low response potential and positive change occurs very slowly.

Juniper encroachment in these areas is generally not a problem and would be considered a low priority for treatment where occurring. Wildfire was a historically infrequent factor to these sites because herbaceous production is too limited to carry fires regularly. Prescribed fire should be avoided since the shallow soils inhibit ecological condition restoration and exotic annual grasses can be a condition issue in some areas, particularly under 4800' elevation.

<u>Stony Claypan 14-20" (10.3% of surveyed area)</u> – All of these areas were found to be in either PNC (64%) or late seral (36%) condition. The existing plant communities that comprise the observed condition classes are considered proper functioning and continued maintenance would be an appropriate management objective.

Juniper encroachment into these areas is a frequent problem since these sites appear to be a fire climax version of the more common - and more rocky - Juniper Claypan 16-20". Areas experiencing invasive juniper would be considered a moderate priority for control activities because the potential for significant ecological improvement is good and risk of annuals is relatively low, though all sites are currently in satisfactory condition.

Claypan 14-20" & Claypan Bottom 12-18" (1.0% of surveyed area) – The majority of these sites (87%) were in PNC or late seral. For these two ecological sites, the existing plant communities that comprise the observed condition classes are considered proper functioning and continued maintenance would be an appropriate management objective. The one small area in mid-seral (north of Copeland Reservoir in the Horsefly allotment) had an appropriate plant community structure (late seral), but was downgraded due to below site average production. The low production is probably an indicator of permanent deterioration, though many of the site characteristics point towards it being a jumbled mix of several sites and/or transitions between distinct sites; a lot of the attributes resemble the low production Shallow Stony ecological site. This area should be managed for at least maintenance of the existing ecological condition with recognition that site productivity is inherently low.

Big Sagebrush/Bitterbrush Dominated Communities (totals 2% of surveyed area)

Shrubby Loam 16-20" (0.8% of surveyed area) – The majority (91%) of these areas were found to be in late seral condition. The existing plant communities that comprise these observed condition classes are considered proper functioning and continued maintenance would be an appropriate management objective. Sites on the lower end of late seral (ratings in the 50's) - especially in lower elevation areas (<4800') - could be at risk of downward trends if receiving consistent heavy grazing use. This is somewhat of an issue, since the grazing use on these sites is almost always higher than the surrounding, shallower soil areas due to the inherently higher productivity of palatable grasses and shrubs. The grazing management in areas where this site is significant should be keyed around the utilization within this site. In areas that are mid seral, a low to moderate priority condition objective would be to improve significantly (>7 percentage points rating increase) over the next 20 years. These sites have a good response potential because of the relatively deep soils and change can occur fairly quickly.

Juniper encroachment into these sites is a distinct and ever growing problem. Wild fire was a common occurrence historically because the high production is relatively high and would have limited the juniper increases. Areas experiencing invasive juniper should be considered a high priority for control activities because the potential for significant ecological improvement is good, though most sites are currently in satisfactory condition. The risk of exotic annual grass increase is relatively low but can be a condition issue in some of areas under the 4800' elevation threshold.

South Slopes 14-18" (0.9% of surveyed area) – A minority of these sites (19%) were found to be in late seral or PNC. The existing plant communities that comprise these observed condition classes are considered proper functioning and continued maintenance would be an appropriate management objective. Sites on the lower end of late seral (ratings in the 50's) could be at risk of downward trends if receiving consistent heavy grazing use.

The majority of these sites (81%) were found to be in mid seral condition, exhibiting the still lingering effects of the overgrazing and site deterioration that occurred prior to the more stringent grazing controls implemented in the mid-20th century. Improvement in conditions has since occurred in these areas, but is significantly restrained by the generally southern aspect, lower elevation, permanent soil loss/degradation, and corresponding susceptibility to exotic (and native) annual invasions. In addition, juniper densities on almost all sites are many times what they would have been with pre-settlement fire regimes. Currently, fire should be avoided in these areas due to an inclination towards dominance by exotic annuals. South Slope sites with at least high mid seral condition (45% rating or more) should be considered a high priority for juniper control, with areas in lesser condition being a lower priority due to the annual invasion problem. In areas that are mid seral, a low to moderate priority condition objective would be to improve significantly (>7 percentage points rating increase) over the next 25-30 years. These sites have a relatively low response potential and positive change in the vegetation community would be expected to occur slowly.

<u>North Slopes 14-18" (0.1% of surveyed area)</u> – This site was recorded at only one location in the Gerber Block and was determined to be in late seral condition. The existing plant community would be considered proper functioning with its continued maintenance an appropriate management objective. Juniper encroachment into these type areas would be considered a problem and was observed as such at the recorded site. This area, though small, would be considered at high priority for juniper control activities.

Mahogany Communities (0.2% of surveyed area)

All of these areas were found to be in late seral condition. Only minimal amounts of this site were specifically classified, though it is very commonly found as unclassified inclusions in pine and/or juniper communities. The existing plant communities that comprise the observed condition classes are considered proper functioning and continued maintenance would be an appropriate management objective. Juniper encroachment, however, is a critical problem in most mahogany areas and should be a high priority for juniper control activities. These sites will probably have a good response potential because of the relatively deep soils.

3. **Juniper Communities** (totals 44.6% of surveyed area)

<u>Juniper Claypan 12-16" (15.3% of surveyed area)</u> – This very common site in the south half of the Gerber Block, classified out with the widest spread of observed condition classes. This ecological site also accounts for the majority of the total early seral and non-pine, mid seral vegetation. Areas that are in late seral or PNC (58% of this sites classified acres) are considered proper functioning and continued maintenance would be an appropriate management objective. Mid seral areas (38%) are probably functional within the context of their current potential (see Step 5), though a low to moderate priority condition objective would be to improve significantly (>7 percentage points rating increase) over the next 25-30 years.

Though this is a true juniper ecological site, increases in juniper density are a variable problem in most areas. Areas in high mid to low late seral (40-60% of PNC) should be considered moderate priority for non-burning juniper treatment activities to remove trees less than 100 years old. The preferred method for control would be hand cutting or mechanical shearing. In areas with higher condition ratings (>60%) juniper densification is less of a problem and is not likely – due to the low productivity – to get much worse very quickly; these areas should be considered a low priority for treatment. Prescribed burning should be avoided in all condition classes of this driest of the "old" juniper sites. Recent observations of prescribed burning activities done in a few high seral areas the past 5 years has indicated that burning leads to dramatic increases in annual exotic grasses with a commensurate decrease in native perennial grasses.

<u>Juniper Claypan 16-20" (23.8% of surveyed area)</u> – This is the most common site in the central and northern portions of the Gerber Block, but is in much better overall condition than the above juniper site due to the slightly higher precipitation and more limited historical grazing misuse. Specifically, the majority (97%) of these areas were found to be in late seral or PNC condition. This ecological site accounts for 55% of the total PNC classified acres. The existing plant communities that comprise these observed condition classes are considered proper functioning and continued maintenance is an appropriate management objective. The limited amounts of mid seral are probably adequately functional and should be managed like described above for the mid seral Juniper Claypan (J-C) 12-16". Juniper encroachment is also similar to that described for the

J-C 12-16", though burning is less of an annual grass catalyst in the J-C 16-20" – especially above about 4900' elevation. Priorities for juniper control activities would be the same as noted for the J-C 12-16" above.

Juniper Loamy Hills 10-14" (1.6% of surveyed area) – This is the ecological site that comprises most of the Willow Valley Chaining in the southwest corner of the Gerber Block. This is the only area that this site was specifically classified in the analysis area. The chained and seeded area (59% of the classified acres) rated as "good" condition, i.e. late seral if the seeded grasses are included in the rating. The existing plant community is considered adequately functioning for a seeded area and continued maintenance of the seeded species (approximately 1/3 of the production) is an appropriate management objective.

The rest of the classified acres were rated as mid seral and are the untreated native range areas outside the chaining/seeding. These areas have a decent late seral mix of plant species, but rated mid seral because of the previously discussed permanent degradation of conditions and potential (see Step 5). Relatively high densities of exotic annual grasses are also a condition depressant. A moderate priority condition objective for these mid seral native areas would be to at least maintain the current ecological numerical rating in the short term (<15 years) and improve significantly (>7 percentage points rating increase) over the next 25-30 years. Implicit in this is a reduction in the annual grasses, though such is hard to precisely measure due to wide production differences from year to year. This site is also susceptible to increased densities of juniper, though it is a true juniper potential ecological site. The juniper related recommendations for the above Juniper Claypan 12-16" are appropriate for this site.

Juniper-Mahogany-Fescue 16-20" (0.3% of surveyed area) – This site is considered a rare, juniper dominated, pine-free version of the following site, which is much more abundant. No specific management recommendations are made for this site.

Juniper-Dry Pine 14-16" (3.6% of surveyed area) – All of the classified acres of this ecological site were found to be in late seral condition. The existing plant communities are considered proper functioning and continued maintenance would be an appropriate management objective. Juniper density increases in this site is a chronic problem and these areas should be considered a high priority for juniper control activities.

Table 6-3 displays priority areas by Ecological Site for juniper. Table 6-4 displays a summary of risk potential, also by Ecological Site, associated with juniper treatment.

4. **Pine Communities** (totals 20.9% of surveyed area)

Pine-Mahogany-Fescue 16-20" (6.1% of surveyed area) – Virtually all (99+%) of this site classified as either late seral or PNC. The existing plant communities are considered proper functioning and continued maintenance would be an appropriate management objective. Juniper density increases within this site is also a chronic problem and is probably the primary cause of the diminishment of the mahogany component in many areas. These sites should be considered a high priority for juniper control activities. Since they are generally not old growth potential sites, all of the juniper should or could be removed. (Also see note below.)

Pine-Sedge-Fescue 16-24" (14.8% of surveyed area) – As noted in Step 5, this site classified almost equally between late seral and mid seral. However, all the mid seral communities had late seral plant species diversity, but were lacking adequate, non-tree production (see note that follows). Maintenance of the current ecological ratings would be considered an appropriate management objective. Juniper encroachment is not a particular factor in these sites, but where it occurs it would be a low to moderate priority for treatment.

Both of the above pine sites have been the primary targets of the Resource Area's prescribed burning program over the past decade. The primary ecological impact of this extensive burning has been a significant diminishment of the non-resprouting shrubs (most shrub species) - plants that appear to take 10-20 years to significantly re-establish. Pine site note: In addition, most of these sites have had some level of past timber harvest. This has also contributed to the decrease in the understory as a consequence of the timber harvest methods and post-harvest reclamation activities. Many of the pine stands have had both timber harvest and burning occur, which in combination, have pushed a large percentage of the Pine-Sedge-Fescue sites into the mid seral condition class. Unlike the juniper and sagebrush/bunchgrass areas, historic livestock grazing appears to have been a limited factor in the condition of the Pine sites. The majority of the areas classified in the two pine sites were estimated during the ESI to have upward trends. This was principally because post-burning/harvest, the herbaceous and shrub understory species have nowhere to go but upward (i.e. increasing in diversity and abundance). Functionality of these sites is thought to be at least adequate with current management; see the Forest Upland Vegetation section for more information.

Table 6-3. Relative Juniper Treatment Priorities by Ecological Site

	Current Conditions/Seral State			
Ecological Site Name	**PNC**	**Late**	**Mid**	**Early**
Unmapped Riparian Areas*	H	H	H	H
Dry Meadow	H	H	H	M-H
Ephemeral Lakebed	—	—	—	—
Semi-Wet Meadow	—	—	—	—
Shallow Stony 10-20"	L	L	L	L
Stony Claypan 14-20"	L	M	M	L
Claypan 14-20"	M	M	M	M
Claypan Bottom 12-18"	M	M	M	M-H
Shrubby Loam 16-20"	H	H	H	M
South Slopes 14-18"	M	H	M-H	M
North Slopes 14-18"	M	H	H	M
Juniper Claypan 12-16"	L	L-M	L-M	L
Juniper Claypan 16-20"	L	L-M	M	L
Juniper Loamy Hills 10-14"	M	H	M-H	L-M
Juniper-Mahogany-Fescue 16-20"	L	H	M-H	L-M
Juniper-Dry Pine 14-16"	M	H	H	L-M
Pine-Mahogany Fescue 16-20"	M	H	H	M
Pine-Sedge-Fescue 16-24"	—	L	L-M	L

H = High Priority, M = Moderate Priority, L = Low Priority, Dashes = Not an issue or not present in Gerber Block
*Unmapped riparian areas are riparian areas that did not have the ESI completed for them; ESI is more of an upland rangeland vegetation survey. However, any riparian area with invasive juniper would be very high priority for treatment and for continuity sake is included in this table.
Ecological Sites in bold are the dominant communities which in combination make up 88.4% of the BLM lands in the Gerber Block.

Table 6-4. Risk potential for significant (>30% of non-tree annual production) undesirable disturbance induced annual grass & forb invasion by Ecological Site.

	Current Condition/Seral State			
Ecological Site Name	**PNC**	**Late**	**Mid**	**Early**
Dry Meadow	L	M*	M-H*	M-H
Ephemeral Lakebed	L	L	L	M*
Semi-Wet Meadow	L	L	L	M*
Shallow Stony 10-20"	M	M	M-H	M-H
Stony Claypan 14-20"	L	L	L-M	M
Claypan 14-20"	L	L	L-M	M
Claypan Bottom 12-18"	L	L	L-M	M
Shrubby Loam 16-20"	L	L-M	L-M**	M-H**
South Slopes 14-18"	L-M	L-M**	M-H**	M-H**
North Slopes 14-18"	L	L	L-M*	M**
Juniper Claypan 12-16"	L-M**	M-H**	H**	H**
Juniper Claypan 16-20"	L	L	L-M*	M
Juniper Loamy Hills 10-14"	L-M**	M-H**	H**	H**
Juniper-Mahogany-Fescue 16-20"	L	L	L-M**	M**
Juniper-Dry Pine 14-16"	L	L-M*	M**	M-H**
Pine-Mahogany Fescue 16-20"	L	L-M*	M*	M-H
Pine-Sedge-Fescue 16-24"	L	L-M*	L-M*	M*

H = High Risk, M = Moderate Risk, L = Low Risk
Ecological Sites in bold are the dominant communities which in combination make up 88.4% of the BLM lands in the Gerber Block.
* In these ecological sites at this condition class, if treatment activities cause a high level of initial annual dominance (>30% of non-tree production), annuals are likely to diminish relatively quickly with a cessation of the stressing factor, i.e. the annuals will likely be quickly driven out by the desired perennial plants. Resiliency to annuals is a function of higher effective precipitation in hand with elevated ecological condition. If an ecological site is already in late seral/ PNC and is "Low Risk" on annual invasion, it is not starred because annuals would be unlikely to gain a significant foothold after disturbance due to the elevated ecological status prior to disturbance.
** Prescribed fire should be avoided in these sites/condition classes due to a high probability of persistent annual grass and/or forb increases. (Annual invasion risk from disturbance from poor or inappropriate management practices, e.g. chronic overgrazing, wild or prescribed fire in wrong place, off-road vehicle use.)

FS Administered Lands - Fremont National Forest

Coordinate burning to increase forage quality and production for livestock and wildlife. Burn invading sagebrush and juniper to restore meadows and natural openings to approximate historic range of variability. Manage for mid to late seral non-forested upland communities when possible. Identify and prioritize areas of concern within the allotments and restore past degraded areas to healthy communities. Promote age diverse aspen stands.

KNOWN DATA GAPS:

- Information regarding browse effects on aspen stands.
- Update current condition and trend vegetation monitoring plots.
- Obtain ecological status information.

Noxious Weeds

It is recommended to continue the implementation of the current noxious weed management programs using an integrated pest management approach on lands within the analysis area to contain or reduce noxious weed infestations and prevent the establishment of new invaders. Integrated pest management includes prevention, education, inventory, coordination, monitoring and evaluation, and control which integrates manual, mechanical, chemical, and biological methods. On BLM lands within the analysis area, this approach is used in accordance with the Klamath Falls Resource Area Integrated Weed Control Plan (IWCP) and Environmental Assessment (EA)(OR-014-93-09), which is tiered to the Northwest Area Noxious Weed Control Program Environmental Impact Statement (EIS) (December 1985) and Supplement (March 1987).

In order to improve the coordination component of the integrated pest management approach to noxious weed management, it is recommended that landowners within the analysis area form a cooperative Weed Management Area (WMA). Participants in the WMA will be able to more efficiently implement the other components of an integrated weed management approach through coordination of efforts across ownership boundaries.

Threatened, Endangered, and Sensitive Plant Species

Oregon/Washington BLM special status species policy for Bureau sensitive species states that BLM Districts will protect, manage and conserve those species and their habitats such that any Bureau action will not contribute to the need to list any of these species. Similar policy for Forest Service sensitive species is contained in the Forest Service Manual (FSM 2670). Oregon/Washington BLM special status species policy for Bureau tracking species states that Districts are encouraged to collect occurrence data on species for which more information is needed to determine status within the state or which no longer need active management.

A conservation strategy for the long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*) produced by the Winema National Forest in 1995 recommended that all populations be protected from ground disturbing human activities, including ground based timber harvest and construction of roads and fire lines. However, fire may have a role in maintaining populations of this species, therefore it is recommended that the effects of prescribed fire on this species be monitored. Anecdotal evidence indicates that grazing may have direct impacts on this species. Therefore, it is recommended that the impacts of grazing be monitored, and that grazing systems be designed to minimize this impact.

A conservation assessment for Baker's globe mallow (*Iliamna bakeri*) produced by the Fremont National Forest in 2000 summarizes evidence that this species is adapted to frequent fire. Therefore, it is recommended that fire be introduced into the habitat of this species, and that the effects of fire be documented. The conservation strategy also summarizes anecdotal evidence that grazing may have direct impacts on this species. Therefore, the impacts of grazing should be documented, and grazing systems should be designed to minimize this impact. A small exclosure around one of the newly documented populations on BLM lands is planned as a first step in the documentation of the effects of grazing.

A conservation strategy for blue-leaved penstemon (*Penstemon glaucinus*) summarizes evidence that this species is adapted to fire as a natural disturbance in the lodgepole pine forest type. Therefore, it is recommended that fire be introduced into the habitat of this species, and that the effects of fire be documented. Planned prescribed fires in the Yainax Butte ACEC, which contains the population of blue-leaved penstemon in the analysis area, will help to implement this recommendation.

Not much is known about the habitat requirements and biology of profuse-flowered mesa mint (*Pogogyne floribunda*), or other species associated with the vernal pool habitat of know populations. A Challenge Cost Share (CCS) has been funded to evaluate the known populations and habitats in Oregon and compare that information to what is known about populations in California. It is recommended to follow any conservation provisions included in the final report for this project.

Fringed campion (*Silene nuda* ssp. *insectivora*) is a tracking species for BLM, therefore no species conservation measures are required other than documentation of occurrence. Similarly, it is not listed as a sensitive species by the Forest Service. However, it is recommended that populations be protected from ground disturbing human activities when possible.

Special Areas

An Area of Critical Environmental Concern (ACEC) designation for BLM lands highlights an area where special management attention is needed to protect and prevent irreparable damage to important historic, cultural or scenic values; fish or wildlife resources; or other natural systems or processes; or to protect human life and safety from natural hazards. It is recommended that land management actions within ACECs follow the special management direction established in the Resource Management Plan/Environmental Impact Statement for the Klamath Falls Resource Area

Research Natural Areas (RNA's) are designated to preserve and protect examples of relatively undisturbed biological communities and the ecological processes that support those communities. These areas are available for short- or long-term scientific study, research, and education, and serve as a baseline against which human impacts on natural systems can be measured. It is recommended that the Goodlow Mountain Research Natural Area be available for education and research on the ponderosa pine forest and transition to sagebrush steppe characteristic of south-central Oregon, and that management actions serve to maintain or restore this remnant of undisturbed natural vegetation communities.

Special botanical areas were designated to protect, maintain, and/or restore specific botanical habitat values. Gap fencing around the Bumpheads Special Botanical Area has been installed to protect the relatively undisturbed bunchgrass/shrub plant community as recommended in the Resource Management Plan/ Environmental Impact Statement for the Klamath Falls Resource Area. No further management is necessary at this time.

Fire and Fuels

It is recommended that the current fuels management direction be continued without change, or expanded, to achieve a more natural (historic) vegetative community consistent with other resource objectives. The following recommendations should be the basis for continuing ecological restoration efforts in the BLM Gerber Block, through fuels management treatments that lead to the reintroduction of a natural fire regime (adapted from Allen, 2002). Methods of treatment should be selected through an interdisciplinary process and site-specific analysis.

- Reduce the risk of conflagration. The initial treatments should be planned to reduce the risk of destructive, stand-replacing wildfire. First priority must be given to human safety for firefighters and the public, and second priority would be protecting the land from devastation.
- Restore ecological processes. The goal of fuels management is to restore the natural disturbance regime, which includes restoring a regular cycle of surface fires to the landscape. Mechanical

thinning alone will not meet this goal, but may be used in combination with prescribed fire to avoid unacceptable harm.

- <u>Recognize the variability of the landscape</u>. When planning prescribed fire and fuels treatments, incorporate the natural variability of disturbance regimes on different vegetation and topography in the Gerber Block. Vary treatments to sustain natural resilience to disturbance events.
- <u>Prioritize treatment areas</u>. Use the principles in the *National Fire Plan* (USDA & USDI 2000); *Juniper Control: Suggested Area Selection Criteria* (Lindsey 2001); and the *Fire Management EA* (USDI 1995) to prioritize treatment efforts. Key criteria are: degree of risk to functioning ecosystems, proximity to human developments and private land, enhancement potential for wildlife species and hydrologic resources, ability to attain natural functioning conditions, breaking continuity of hazardous fuels, and economic feasibility.
- <u>Protect sensitive and unique communities and values</u>. Protect ecological communities that could be adversely affected by mechanical treatments or prescribed burning, such as unique wildlife/fish habitat, riparian resources, or small inclusions of distinct vegetation types within a larger ecotype. Protect sensitive species of flora and fauna, and avoid damage to cultural resources. Retain large and old trees, snags, and logs from the effects of fuels treatments.
- <u>Use multiple actions to achieve a natural maintenance function</u>. Generally, three treatments are thought to be necessary to attain a functioning fire-resistant stand, within the natural range of variability. Although each patch requires site-specific planning and may vary from this general rule, multiple entries are usually needed to avoid intense, destructive fires that result in negative resource outcomes. Mechanical treatments may be used first, in sensitive areas or to avoid conflagration.
- <u>Restore historic vegetation communities</u>. Where fire suppression has allowed fire-intolerant tree species like juniper, white fir, annual grasses and noxious weeds to invade historically fire-adapted forests and rangelands, fire treatments should set a trend toward the traditional species composition. Natural regeneration processes should be incorporated into the treatment schedule.
- <u>Assess cumulative effects</u>. Fuels management efforts will impact thousands of acres every year, for many decades, until maintenance levels are reached. Other management efforts will continue to impact BLM lands in the Gerber Block, and the surrounding private and public lands are undergoing changes at the same time. Cumulative effects must be assessed on a continuing basis.
- <u>Plan treatments to minimize spread of exotic species and noxious weeds</u>. Use best management practices to avoid spreading weeds by mechanical equipment, fire impacts, or hydrology. Plan burning and follow-up treatments to mitigate the spread of exotic annual grasses and forbs.
- <u>Protect sensitive areas such as riparian zones from premature grazing pressure</u>. Where possible, defer livestock grazing after fire treatments until the herbaceous layer has fully recovered (2-3 years). This would require blocking up fuels treatments within certain grazing pastures, rather than scatter the treatments throughout the entire allotment.
- <u>Implement adaptive management</u>. Ecological restoration is an incremental process that may take a century or two to fully achieve. Restoration will be most successful where land managers learn from actual treatment experiences and adaptively adjust their approaches through time.
- <u>Establish monitoring and cooperative research programs</u>. The KFRA—RMP stipulates that 20% of resource area projects must be monitored to assure that management recommendations and constraints have been met, and numerous monitoring points have been set up in the Gerber Block. There should be a long-term commitment to monitoring as the key to adaptive management. There are also occasionally opportunities for cooperative research on fuels treatments that can be incorporated for more specific information.

USFS - Forest-wide Standards for Fire Protection

- Provide and execute a fire protection and fire use program that is cost-efficient, and responsive to land and resource management goals and objectives.
- All wildfire will receive an appropriate suppression response, utilizing a stategy of confine, contain, or control.
- Wildfires that threaten life, property, public safety, improvements, or investments will receive aggressive suppression action using a control strategy.
- Prescribed fire will be considered for use in meeting management objectives in areas where ecological studies show that fire has played a significant role in ecosystem development.

USFS - Best Management Practices for Fire Suppression and Fuels Management

- F-1. Fire and Fuels Management activities.
- F-2. Consideration of water quality in formulating prescribed fire prescriptions.
- F-3. Protection of water quality during prescribed fire operations.
- F-4. Minimizing watershed damage from fire suppression efforts.
- F-5. Repair or stabilization of fire suppression related watershed damage.
- F-6. Emergency rehabilitation of watersheds following wildfires.

III. Terrestrial Species and Habitat

General

- Reduce juniper/conifer encroachment into historical timber, aspen, shrub and grassland habitats.
- Create a mosaic of overstory and understory age classes by treating (prescribed burning, mechanical, etc.) approximately 3% per year over the next 30 years.

Threatened, Endangered and Sensitive Species

Bald Eagle

- Continue to protect known nest sites and potential nesting habitat with limited operating seasons and restrictions in place.
- Continue to monitor and survey for eagles and eagle habitat, and support other agencies or organizations in efforts to study eagles and their habitat.
- Maintain existing and culture mature trees within one mile of lakes and reservoirs to sustain existing and provide future nesting trees for bald eagles.
- Use prescribed burning, road management, and mechanical treatments including commercial and precommercial thinning to establish preferred nest/roost tree or stand characteristics and enhance prey base habitats to increase prey populations.
- Consider installing artificial nesting platforms in areas that lack suitable bald eagle nesting structure.
- Consider enhancing fish populations in areas frequently used by bald eagles for forging.

American Peregrine Falcon

- Protect known and potential nesting habitat (cliffs) with limited operating seasons within ¼ mile of nests.
- Continue to monitor and survey for peregrines and peregrine habitat, and support other agencies or organizations in efforts to study falcons and their habitat.

- Conduct periodic surveys for peregrine falcon activity at identified cliff sites especially if activities are proposed in the area. If peregrine nesting activity is identified, initiate a peregrine falcon management area plan to protect and enhance nesting, foraging and security habitats. Consider mechanical treatments, prescribed fire, road closures and activity restrictions to protect and enhance habitats (USFS, 2000).

Northwestern pond turtle (Federal Species of Concern; Bureau Assessment Species in Oregon)

- Specific surveys directed toward presence/absence of pond turtles and documentation of suitable habitat need to be implemented.
- Stream and adjacent riparian restorations and enhancements will likely increase the potential for pond turtles to occur within the watersheds.
- Continue to monitor and survey for pond turtles and pond turtle habitat, and support other agencies or organizations in efforts to study northwestern pond turtles and their habitat.

Bats

- There is a lack of information on bats within the analysis area. Surveys to determine a species list, distribution, preferred habitats/microhabitats and abundance should be conducted.
- Support other agencies or organizations in efforts to study bats and their habitat.
- Roosting and maternal colony sites should be identified and protected, or even constructed.
- As stated in the KFRA/RMP, protection of snags and live trees suitable for roosting should be implemented with bats considered.
- Cliffs, caves and other rock structures, buildings and other structures used by bats should be protected.
- In areas where structure is lacking, installing artificial structures should be considered. Bridges and signs can also be modified to improve bat habitat.

Great Gray Owl (BLM Survey and Manage Species, State Sensitive Vulnerable in Oregon)

- Specific surveys directed toward presence/absence of great gray owls and documentation of suitable habitat need to be implemented.
- Retain or create large snags as nesting habitat, especially broken top snags and trees containing cavities large enough to be suitable for great gray owls.
- Maintain openings and reduce juniper/conifer encroachment into meadows.

Big Game

- Maintain visual screening cover along roads.
- Maintain and enforce current winter range road closure plans and consider monitoring affects of closures on big game populations.
- Manage forage, cover, and road densities on mule deer and elk ranges to provide habitat conditions necessary to meet Oregon Department of Fish and Wildlife (ODFW) and Klamath Tribe herd objectives over the long term.
- Design forest thinning treatments to provide a variety of spacing conditions, including patch cuts to increase forage and no cut or minimal cut leave patches of dense structure. Treated stands should retain an interspersion of cover and forage where leave patches intended to provide thermal and/or hiding cover are 2 - 26 acres in size (Hershey 1997).
- A reduction in hiding cover will occur for deer and elk with loss of shrubs, seedling/saplings and reductions in understories from prescribed burning and understory thinnings, prescriptions should be designed to minimize these effects. Treatments will provide early successional plant communities beneficial to foraging deer and elk.

- Manage road densities on all seasonal big game ranges to meet the 2.5 miles/square mile, or less, standard in the Fremont LRMP. On BLM land, manage road densities on all seasonal big game ranges to meet the 1.5 miles/square mile, or less, standard in the Klamath Falls Resource Area RMP.
- In areas where water supply is deemed to be a limiting factor in big game populations, cistern, guzzler and/or pond-type impoundment installation should be considered.
- Maintain the quantity and quality of edge habitat. Use prescribed fire and selective thinning to maintain or enhance edge habitat. In existing small burns and regeneration harvest units (<80 acres), maintain 1 to 25 acre forage patches on sites near the edge of units. In more extensive burn areas, maintain 1 to 40 acre forage patches in a mosaic (Hershey 1997). Priority areas for treatment include those sites where shrubby forage species are decadent, forage productivity has declined because of an increase in forest cover, and/or preferred forage species occur. These openings will help maintain early seral foraging habitat for a longer period of time during forest stand development.
- Reduce thinning slash and stem density where herbaceous and woody understory plant growth is limited. Emphasize hand piling or burning treatment where appropriate and limit mechanical treatments where soil objectives are a concern.
- Consider forage seeding of obliterated roads, skid trails, and landings to increase the forage base. Use prescribed fire and manual or mechanical treatments to increase the quality, quantity, and species diversity of foraging habitat.
- Monitor mule deer and elk habitat conditions within high use areas to determine the most appropriate fire return interval.

<u>Mule Deer</u>

- Reduce juniper/conifer encroachment in shrub areas and meadows. Create a mosaic of brush age classes by burning and/or mechanically or manually treating approximately 3% per year over the next 30 years.
- A combination of treatments and protection of existing habitat features will provide forage and cover in a more favorable ratio, while reductions in road densities will increase security and make available more acres of useable habitat. The potential exists for declines in mule deer populations as habitat is treated with prescribed fire and/or mechanical understory treatments. These treatments will reduce cover, shrubby forage densities, and effective habitat, but will improve shrub age-class diversity, herbaceous forage, tree and plant vigor and productivity over the long term.

<u>Elk</u>

- Maintain openings and reduce juniper/conifer encroachment into meadows.
- Identify areas of elk concentration and implement seasonal road closures to minimize disturbance to elk populations.
- Elk foraging habitat will increase with increases in grasses and herbaceous species. A corresponding increase in elk population numbers can be expected.

<u>Pronghorn</u>

- Improve the quality and quantity of sagebrush-steppe habitat by reducing juniper/conifer encroachment.
- Consider modifying grazing programs to benefit pronghorn populations and monitoring to analyze effects.
- Manage and consider water spreaders as important pronghorn habitat.
- Use pronghorn friendly fences and fencing strategies whenever possible.

Terrestrial Species Associated with Late/Old Successional (LOS) Forest Habitats

- In all stands of ponderosa pine and pine associated forest, design future timber harvest treatments to maintain or restore snags and green replacement trees.
- Manage snags and green tree replacements in dispersed clumps rather than individual trees uniformly scattered over the landscape. Manage snags and green replacement trees in the same species composition as is represented in the stand. Retain spike- topped and lightning-scarred trees to provide alternate nesting substrates.
- In snag deficient areas, where feasible and appropriate, create snags from live trees. Implement top blasting, top girdling, and/or inoculants to create snags. Consider using bat slits/flanges, mimicking lightning strikes and creating sap wells and cavities in created snags and existing hard snags to enhance snag habitat features and increase wildlife use.
- Culture green tree replacements in early and mid-seral stands to develop future large diameter snags at the desired species composition and distribution for the full stand rotation.
- Many wildlife species rely on moderate to high levels of down logs and snags for nesting, roosting and feeding. Large down logs are a common and important habitat component of LOS forest habitats. Past management activities have greatly reduced the number and availability of snags and down logs in managed stands. Protect down logs and snags with fuel breaks and/or burn prescription where necessary to maintain the desired densities and size classes when implementing prescribed burn treatments.
- Lighting direction should specify avoidance of clumps of snags and down logs. Where case hardened logs result from burn treatments or wildfire, mechanically cut slits in logs or cut logs in half to improve habitat for wildlife use. This is especially critical in pileated woodpecker foraging areas, goshawk areas, and riparian areas (USFS, 2000).
- To improve connectivity over time, designate stands that will be managed to become LOS between currently designated old growth patches. Locate new potential LOS stands approximately halfway between existing designated patches. Actively manage these habitat types to reduce the risk of stand replacing wildfire.
- Maintain or restore the abundance and distribution of large diameter live trees, large diameter snags, and large down logs in all forested stands. To accelerate the development of large diameter trees, mechanical and prescribed fire treatments should be implemented where appropriate to thin overstocked stands. Retention and recruitment of large trees should be a priority in stands dominated by younger age classes (USFS, 2000).
- Implement mechanical and prescribed burning treatments to: reduce stand densities, thin overstocked understories, reduce accumulated duff, culture patches of non-uniform multi-storied pine understories and large diameter trees, future snags and down logs.

Northern Goshawk

- Manage to protect active and historic nest stands and treat replacement nest stands and foraging areas to develop and/or restore preferred habitat conditions for goshawk nesting and rearing and to provide prey species habitat needs.
- Continue to conduct specific surveys directed toward presence/absence of northern goshawks and documentation of suitable habitat.
- Continue to protect known nest sites and potential nesting habitat with limited operating seasons and restrictions in place.
- Try to coordinate vegetation treatments that are designed to meet goshawk habitat needs with treatments designed to meet other objectives (i.e. improve sustainability, hydrologic function, stand diversity, etc.).
- Prescribed fire should be utilized where it is possible to return the disturbance regime to a frequent fire return interval. Once stands are stable, use prescribed underburns on a periodic schedule to maintain

structure. Retain younger ponderosa pine within classic bounds of upper and lower management limits.
- In stands with overstocked understories and high fuel loadings, thin from below with variable or non-uniform spacing using mechanical/manual treatments and/or prescribed fire to promote large tree growth, crown development, understory herb and shrub development, and open stand conditions for hunting and prey availability. Lop and scatter slash that cannot be burned.

American Marten

- Determine/verify marten presence/absence in the watershed on a project by project basis, or through yearly monitoring activities.
- Manage for a higher basal area of large diameter fir (>15" dbh) in true mixed conifer plant associations where occupied or suspected marten habitat occurs. Canopy closures in forest stands where occupation is evident should be managed at > 40%.
- Maintain or restore an abundance of large diameter snags as potential den sites (USFS, 2000). Consider managing large down wood in occupied habitat at levels recommended in recent literature (Quigley et al, 1997).

Pileated Woodpecker

- Determine/verify pileated woodpecker presence/absence in the watershed on a project by project basis, or through yearly monitoring activities.
- Manage for a higher basal area of large diameter fir (>15" dbh) in true mixed conifer plant associations where occupied and historic pileated woodpecker foraging and nesting habitat occurs. Canopy closures in forest stands where foraging or occupation is evident should be managed at > 60%.
- Maintain or restore an abundance of large diameter snags as potential nesting trees (USFS, 2000). Consider managing large down wood in occupied habitat at levels recommended in recent literature (Quigley et al, 1997).

Black-backed/White-headed Woodpecker

- Manage for retention of snags with bark intact. Maintain snag numbers during salvage activities in ponderosa pine stands (USFS, 2000).
- Determine/verify woodpecker presence/absence in the watersheds on a project-by-project basis, or through yearly monitoring activities.
- Consider managing snags in pine habitats where black-backed woodpecker activity is evident at levels recommended in recent literature (Quigley et al, 1997).

Terrestrial Species Associated with Sagebrush Steppe Habitat

General

- Restore sagebrush and other shrub habitats.
- Reduce competition by removing junipers and/or conifers in order to achieve a more historic level of sagebrush steppe composition. Reduce or remove decadent shrubs to allow better regeneration and lower wildfire risk by prescribed burning, slashbusting or mowing.
- Plant and/or seed sagebrush and other shrub species to restore historic sagebrush areas.
- When prescribed burning is used as treatment, the risk of invasion by noxious weeds such as cheat grass should be seriously considered.

Western Sage Grouse

- Continue sage grouse surveys and monitoring.
- Reduce juniper encroachment into historical sage grouse habitat. Create a mosaic of sagebrush age classes by treating approximately 3% per year over the next 30 years. Increase/improve grass/forb/ shrub potential for sage grouse by implementing grazing practices that will retain seed in historical sage grouse habitat.
- Manage and consider water spreaders as important sage grouse habitat.
- Design treatments to leave a mosaic of treated and untreated islands of sagebrush, establish a variety of sagebrush seral stages to meet the entire life cycle needs of sage grouse, and reduce conifer encroachment into sagebrush habitats (USFS, 2000).
- Consider possible sage grouse reintroduction if needed.

Pygmy Rabbit (Federal Species of Concern; Bureau Assessment Species in Oregon)

- Pygmy rabbit surveys should be conducted to detect individuals and burrow systems. Suitable and marginal habitat should be examined in order to document presence.
- Big sage clumps and stringers and adjacent deeper soil habitats should be protected and maintained.
- Reseed/plant big sagebrush in burned big sagebrush areas that were historically pygmy rabbit habitat. Protect seeded areas from livestock grazing for several years until sagebrush is established or adjust grazing levels to allow recovery.
- Protect sagebrush on floodplains and where high water tables allow for growth of tall, dense stands.

Terrestrial Species Associated with Aspen/Riparian Habitat

General
- Management actions should be directed toward maintaining and increasing amount and vigor of aspen/ riparian habitat. (See specific recommendations in “Forested Uplands” and “Grazing” sub-sections.)
- Actual replanting of aspen may be used in certain situations if needed.
- Fencing of riparian areas should be considered if other active or passive restoration efforts are not meeting objectives.

Red-naped/Red-breasted Sapsucker

- Verify the location and condition, and map aspen stands where necessary on a project by project basis or through yearly monitoring activities throughout the watershed. Manage for more acres of aspen habitat than presently exists on the landscape to help move the diversity and distribution of deciduous plant communities toward the historic range of variability. Where appropriate implement small patch regeneration treatments to restore stands of shade intolerant deciduous species such as alder, willow, aspen, and dogwood.
- Manage aspen stands to maintain the dominance of aspen stems in both the mature and early seral stages. Mature stands in poor condition will receive priority for treatment. Converted stands will be protected from cattle grazing and ungulate browsing if necessary utilizing a variety of techniques. Livestock grazing of aspen suckers will be controlled where necessary until regeneration is a minimum 4-6' tall to insure stand replacement within 5 years of treatment.
- Manage mixed aspen stands to maintain at least the present basal area ratio of aspen in the stand.
- Implement mechanical and/or prescribed fire treatments to promote suckering in mature aspen clones that are without adequate replacement stems and still support a root system capable of responding to treatment.

- Plant aspen where relic mature/decadent trees indicate site conditions are favorable for aspen establishment and growth.

Beaver

- There is a lack of information on historic and current beaver activity. Impacts and affects of bank denning should be studied.
- Verify extent of active and historic beaver activity in the watershed on a project by project basis or through yearly monitoring activities. Document conditions of identified sites and determine the sites' ability to support beaver occupation. Specific protocols should be implemented to determine site suitability for beavers.
- Maintain and restore beaver habitat, deciduous and herbaceous forage species, and water availability near active and historic colony sites where these factors may be limiting re-colonization or productivity. Coordinate with hydrology, fisheries, and range programs to increase water levels in riparian areas where downcutting has occurred.
- Implement a multi-year beaver transplant program in areas of potential and/or formerly occupied habitat where adequate herbaceous and deciduous forage exists for colony establishment. Multiple transplants over several years may be necessary for beaver to successfully restore habitat conditions to allow for yearlong occupancy.
- Manage livestock stocking rates, season-of-use, and grazing schemes to maintain or restore deciduous and herbaceous forage species and water availability near active and historic colony sites. The same limits should be administered within riparian and shrub communities where the potential for beaver habitat exists in watershed drainages.

Other Terrestrial Species

General

- Use vegetation treatments to enhance shrub-steppe, meadow, riparian and open forest habitats.
- Design treatments in shrub-steppe habitats to minimize loss of winter and security cover by leaving a mosaic of burned and unburned islands, to establish a variety of seral stages, and to reduce juniper/conifer encroachment.
- Design treatments in riparian habitats to stimulate deciduous and herbaceous species production and to reduce juniper/conifer encroachment.
- Design treatments in forested habitats to increase open forest habitat while providing for a diversity of healthy, forested habitats across the landscape.

Herptiles

- Continue implementation of specific surveys directed toward presence/absence of herptiles and documentation of suitable/critical habitat.
- Consider active or passive bullfrog management.
- Identify and protect potential hibernacula and denning areas.

Osprey

- Continue to protect known nest sites and potential nesting habitat with limited operating seasons and restrictions in place.
- Continue to monitor and survey for osprey and osprey habitat, and support other agencies or organizations in efforts to study osprey and their habitat.
- Maintain existing and culture mature trees within one mile of lakes and reservoirs to provide existing and future nesting trees for osprey.

- Consider installing artificial nesting platforms or topping trees to create nesting structure.

Landbirds

- Continue to monitor and survey for landbirds and landbird habitat, and support other agencies or organizations in efforts to study landbirds and their habitat.
- Continue to conduct specific surveys directed toward presence/absence of landbirds and documentation of suitable habitat need to be implemented.

- Use various types of landbird surveys to help identify critical or important habitats that need management and/or protection.
- Reduce juniper encroachment into historical shrub, grassland and meadow habitats. Create a mosaic of age classes by burning/machine treating approximately 3% per year over the next 30 years.

IV. Human Uses

Timber

Thinning treatments in forests and woodlands will generate large volumes of generally small material. To the extent that markets allow, this material should be made available to private operators for use as lumber, firewood, posts, poles, chips for pulpwood, biomass for energy production, or any other useable wood product. Service contracts including provisions for sale of commercial products would be a useful tool for such stand treatments.

Grazing

BLM Administered Lands - (The "Gerber Block") - Recommendations will be made on an allotment specific basis since that is the scale at which grazing management is authorized and controlled, i.e. through the allotment specific grazing permit or lease. Though allotments may have a topographic or hydrologic break comprising a portion of its defined boundary, fencing is by far the most common (and effective) boundary-defining feature. Actual grazing management changes are required to be made via grazing decisions or agreements, as specified under the grazing regulations at 43 CFR Part 4100.

"J" Spring Allotment (0803)

Grazing Management: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The current season of use and grazing level is not detrimental and is maintaining or enhancing the already elevated ecological conditions found on the allotment. The 5 Oregon/Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are currently being met on the allotment.

Monitoring: The combination of low priority status and existing good vegetation conditions on this allotment implies that intensive rangeland monitoring studies are not necessary. It is recommended, however, that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed. This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential rangeland health problems at a level of effort commensurate with this allotment's resource importance.

Paddock Allotment (0844)

Grazing Management: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The current season of use and grazing level is not detrimental and is maintaining or enhancing the already elevated ecological conditions found on the allotment. The 5 Oregon/Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are currently being met on the allotment. One exception to the maintenance of status quo is that an alternating grazing season (i.e. spring use one year, fall use the next) may be of some resource utility – or at least benign - and has been suggested by the grazing permittee. While not a mandatory management action, this option may be explored in the near future as it could help improve conditions on the small mid-seral Pine-Sedge-Fescue area and possibly help the conditions of the small meadow in the extreme southeast corner of the allotment. In addition, if the conditions in the meadow do not exhibit adequate improvement over time, several options could be implemented individually or in combination, as follows:

-Construct one or two small reservoirs/catchments on the extreme western side of the allotment. These could potentially provide adequate enough water to substantially draw the cattle away from the meadow and to the uplands. (Note: These two reservoirs are being pursued with the grazing permittee at the time of this analysis preparation.)

-The other option would be to fence the BLM meadow separately as a small riparian pasture, with the grazing use dependent on the speed of improvement desired.

Monitoring: This allotments' combination of low priority status and existing good vegetation conditions implies that intensive rangeland monitoring studies are not necessary. It is recommended, however, that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed. This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential rangeland health problems at a level of effort commensurate with this allotment's resource importance.

In addition, the general grazing/vegetation status of the small meadow in the extreme southeast corner of the allotment should be periodically field checked (i.e. every 2-3 years) to ensure that conditions are not deteriorating, though that is an unlikely occurrence with the relatively new fencing. The establishment of a long-term photo point in this meadow would be useful and is recommended, dependent on workload and other priorities.

Yainax Allotment (0861)

Grazing Management: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The Yainax Butte CRMP was revised in recent years and appears to be largely followed and functioning. However, the BLM administered lands are an extremely minor component (~6%) of the overall area and the grazing is administered primarily by the USFS. The current grazing season of use and levels appear to be appropriate based on current information and monitoring. As noted in Step 5, the *Rangeland Health Standards Assessment* for this allotment is scheduled for completion in 2003 and not as part of this analysis. The resource information and analyses in this document will be a major reference when preparing that Assessment.

Monitoring: As an "M" category allotment, this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes utilization readings (points and/or pattern mapping) every 3-5 years and the re-taking of the photo trend point every five years. In addition, it is recommended that a Rangeland Health Evaluation Summary Worksheet(s) be prepared for this allotment during the late summer or fall of 2002. This qualitative assessment process is outlined in BLM

Technical Reference 1734-6 and would provide ecological and watershed function information for the Assessment. It could also provide early warning of potential rangeland health problems and potentially help point out if more monitoring studies are needed. Due to the fragmented nature of this allotment, two Evaluation Worksheets may need to be prepared to properly represent the allotments vegetative diversity. This would include one evaluation on or around Yainax Butte and one in the extreme western portion of the allotment in the Mud Spring area.

Bear Valley Allotment (0876)

Grazing Management: The following is quoted from the *Management Recommendations* section of the Bear Valley Assessment. Since this was a recently completed Assessment, no additional management actions are proposed at this time.

"The current grazing system is designed for livestock use of the Bear Valley allotment after use on the Willow Valley allotment. As mentioned (in the Assessment), the current operators have permits for both allotments. The current season of use of 7/1 to 8/7 has maintained or improved the mainly late seral to PNC conditions on the allotment. However, with the large amount of private land in the allotment, there are some management concerns/options that should be addressed. Currently, there is no exchange-of-use grazing authorization for the approximately 4780 acres of private land within the allotment. The livestock utilize these private lands since they are not fenced separate from the federal lands. When combined with the 5018 acres of federal land, the current allocation of 475 AUMs spread over 9798 acres results in about 21 acres/AUM. This stocking rate has resulted in the current good to excellent conditions on the allotment. Any future requests for exchange-of-use allocations for this private land would have to be weighed against these facts. Allocation of additional AUMs would likely result in increased utilization levels and a trend toward degraded conditions on both the private and federal lands. In addition, if substantial portions of these lands were to be fenced separate from the federal lands, an evaluation of the carrying capacity of the remaining available lands would need to be done.

The Bear Valley Flat pasture is primarily private land owned by John Anderson. This area is predominantly a flooded playa that holds water through most of the spring and into the early summer. In the late summer, the water level subsides and the area is a wet meadow site dominated by *Eleocharis* species. This allows for livestock use during this period. Past use on this pasture has been made in late August and early September, outside of the prescribed use period for the allotment. With the majority of the grazed area being private, it is recommended that the season of use for this pasture be from mid August to mid September. The billing for this pasture should be based upon percent Federal range using 15% for the BLM portion.

The current season-of-use on the North and South pastures of 7/1-8/7 with the alternating first pasture should be maintained. A 5-10 day flexibility on either end of this period to allow for the variations in annual forage conditions and the needs of the operators should be included.

Juniper treatment projects should be pursued on the ecological sites where the increase in juniper will have a negative effect on the plant and animal communities. The highest priority areas would be the Pine-Mahogany-Fescue and the Juniper-Dry Pine sites where the juniper increase is starting to cause a decrease in the shrub component.

The existing range improvements are in good functioning condition. Some juniper treatment could be done above the developed spring sites to improve flow. The exterior allotment fences are getting to an age where replacement will be needed in the next 5-10 years."

Monitoring: As an "I" category allotment, this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes utilization readings (points and/or pattern mapping, Cole Browse) every other year, the re-taking of the photo trend point and reading of the frequency trend plot every five years, re-reading the Key Area Condition study as necessary, and the reading of the riparian photo points.

Bumpheads Allotment (0877)

Grazing Management:
1. The short section of Antelope Creek that is in the allotment should be fenced to exclude livestock if riparian conditions cannot be improved through the current management.
2. Juniper control projects should be implemented in areas of the allotment where the density of young (less than 100 years old) junipers is negatively affecting the native shrubs and grasses.
3. Utilization studies have shown mainly light to moderate use levels throughout most of the allotment. The current pasture rotation that alternates the use periods between the two pastures should be continued.
4. From the monitoring data it is evident that the west part of the allotment, especially the area below the rim, is in poor vegetative condition. As part of the grazing management, livestock should be pushed to the east part of the allotment in an attempt to decrease the use in this west part. However, it is highly likely that this portion of the allotment does not have the current potential for the vegetation to restore to PNC, or possibly even later seral.

<u>Monitoring</u>: The current monitoring studies should continue on the allotment. Frequency Trend studies from the sites in the west part of the allotment will be reread in the next 3-4 years. These will give good information on the direction that the vegetation is headed. Use mapping on the west end of the allotment below the rim should be done. This area is hard to get to due to the need for access through private land. With the less than good conditions in this area, it is important to get a good feel for the utilization being made.

Campbell Allotment (0878)

<u>Grazing Management</u>: The current licensed livestock grazing in this allotment is for 37 horses, which includes the Exchange-of-Use for the intermingled private land. From field observations, it appears that cattle are making some limited use with little sign of horse use. This has not resulted in any resource concerns, but the permit may need to be reviewed and changed if cattle are the primary livestock on the allotment.

Most of the allotment is in late seral to PNC condition. The one pending condition issue is the juniper invasion of many areas above and below Goodlow Rim. Most areas still have some understory of shrubs and grasses that would greatly benefit from a juniper reduction project. Big sage communities are limited on BLM lands in this part of the KFRA and treatment of this area should receive high priority due to the wildlife habitat potential.

<u>Monitoring</u>: The combination of low priority status and existing good vegetation conditions on this allotment implies that intensive rangeland monitoring studies are not necessary. It is recommended, however, that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the original Summary Worksheet was completed. This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential rangeland health problems at a level of effort commensurate with this allotment's resource importance.

DeVaul Allotment (0879)

<u>Grazing Management</u>: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The current season of use and grazing level is apparently not detrimental to maintaining/enhancing the already elevated ecological conditions found on the allotment. The 5 Oregon/ Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are being met on the allotment with current grazing.

The grazing permittees on this allotment – who are the private lands owners - have suggested recently that they would like to fence their private lands away from the BLM lands in order to limit the off-season livestock use of the BLM lands. Though there have not been any recent resource problems associated with the post-season use, it does present an administrative conceptual problem. In order to make use of the BLM licensed lands during the season of use, the gates on such a fence would have to be left open in order to provide livestock water since there is none on BLM. However, it is not BLM policy to fence private/BLM boundaries, though private landowners are welcome (and often encouraged) to do such. This will be dealt with as necessary in the future.

<u>Monitoring</u>: This allotments combination of low priority status and existing good vegetation conditions implies that intensive rangeland monitoring studies are not necessary. It is recommended, however, that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed. This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential rangeland health problems at a level of effort commensurate with this allotment's resource importance.

Goodlow Allotment (0881)

<u>Grazing Management</u>: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The current season of use and grazing level is apparently not detrimental to maintaining/enhancing the already elevated ecological conditions found on the allotment. The 5 Oregon/ Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are all being met on the allotment with current grazing. Because of the relatively recent division fencing between public and private and the very recent – and apparently successful - construction of a catchment water hole, the use of the BLM lands can now be made discretely and separately from the private lands. This control should also help to maintain or enhance the existing good ecological conditions.

<u>Monitoring</u>: The combination of low priority status and existing good vegetation conditions in the Goodlow Allotment implies that intensive, long term rangeland monitoring studies are not necessary. However, several field-monitoring checks are recommended, if funding and manpower allow. First, a Rangeland Health Evaluation Summary Worksheet could be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed (UTM coordinates in allotment file). This would include retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential rangeland health problems at a level of effort commensurate with this allotment's resource importance.

In addition, it is recommended that post-grazing season utilization checks (use pattern mapping and/or key forage plant readings) be done in 2001 and 2003/2004. The new fencing/waterhole isolate the BLM administered lands away from the private lands; utilization observations should be done in order to affirm that the grazing use of the BLM lands is still appropriate.

Horsefly Allotment (0882)

Grazing Management: The following is quoted from the *Management Recommendations* section of the Horsefly Assessment. Since this was a recently completed Assessment, no additional management actions are proposed at this time.

"No changes in grazing management are proposed because the current grazing management is either meeting the Standards, or is making significant progress towards meeting them - where grazing is known to be a resource issue. The current grazing management is also required to be followed under the most recent Biological Opinion (from the ongoing Section 7 consultation) for Horsefly.

Several rangeland improvement/restoration projects could be pursued that would assist in enhancing resource conditions. One possible project would be to patch the dike of the old reservoir in the Round Valley pasture (noted in the condition section on page 5) restoring its water holding capacity. This would at least diminish the currently weedy vegetation and if the pond retains water long enough, possibly convert the vegetation to a spike-rush community.

Juniper reduction should also be pursued in most ecological sites on the Horsefly allotment. This needs to be seriously considered if we are to stop the deterioration of conditions on most of the ecological sites in the Gerber Block. Specifically, the following juniper removal or thinning should be considered as listed below (with dominant ecological sites in Gerber listed):

- Virtually all juniper could be removed from the true non-juniper ecological sites (Shallow Stony 10-20", Stony Claypan 14-20", Claypan 14-20", and to a limited degree - Claypan Bottom 12-18"). Non-juniper sites should have 0-1% juniper.
- Most of the younger trees (<100 years) could be removed from the true "old" juniper sites (Juniper Claypan 12-16", Juniper Claypan 16-20").
- Reductions to achieve a mix of age classes could be done in the other juniper potential sites (Juniper-Pine-Bunchgrass 12-16", Juniper Loamy Hills 10-14", South Slopes 14-18", Shrubby Loam 16-20", Mahogany Rockland 10-20"). Juniper amounts should reflect amounts allowed in ecological site descriptions.
- Juniper should be brought closer to that described in the ecological site description on the ponderosa pine sites, with all age classes represented but as a minor component (Pine-Mahogany-Fescue 16-20", Pine-Sedge-Fescue)."

The above recommendations still hold true and no additional grazing management changes are proposed at this time. The actual grazing system and parameters are outlined in the 1998 Biological Assessment/ Evaluation for this allotment. There is one additional recommendation pertinent to potential juniper control activities involving prescribed burning for the Juniper Claypan 12-16" ecological site. See the *"Vegetation – Non-Forested Uplands"* portion of this step.

There are two rangeland improvement projects that may enhance the current management on the allotment. Both projects would require a cooperative effort with the primary intermingled landowners – U.S. Timberlands and Circle 5 Ranch. The projects are as follows:

-Riparian fencing to control the livestock use on the private land portions of Long Branch Creek in the Norcross pasture. The private portions of Long Branch are frequently used heavily by livestock; the BLM portions were fenced separately some years ago and have been improving in condition since.

-Somewhat related to the previous proposal, fencing to divide the Norcross pasture into two separate pastures may be useful. Division fencing would help to lighten and control the use on Long Branch Creek as well as provide more rest/deferment for the upland portions of the pasture. Norcross is the largest pasture in the Horsefly allotment and somewhat out of balance in relationship to the other pastures. Additionally, Long Branch Creek is probably the most important tributary to Barnes Valley Creek.

Monitoring: As an "I" category allotment and as an allotment under Section 7 consultation, Horsefly has had a very high level of rangeland monitoring studies established and read. The monitoring system in place has been addressed in the KFRA's monitoring plan and it is recommended that the schedule be followed. This includes utilization readings (points and/or pattern mapping, Cole Browse) every other year, the re-taking of the photo trend point and reading of the frequency trend plot every five years, re-reading the Key Area Condition study as necessary, and the reading of the various riparian monitoring studies. No additional rangeland monitoring studies are deemed necessary at this time.

Horton Allotment (0883)

Grazing Management: The following is quoted from the *Management Recommendations* section of the Horton Assessment. Since this was a recently completed Assessment, no additional management actions are proposed at this time.

"Standards 1, 3, and 5 are not being fully met, but significant progress is being made. With all the juniper reduction treatments that have been completed there has been a significant amount of disturbance on the allotment. Monitoring of the livestock grazing should continue to be done. This should include use mapping and utilization points for 3-4 years. Observations of any changes in vegetation species cover, distribution, etc. can also be made during these monitoring visits.

As noted under Standard 2, juniper treatments could extend into and across the stream channel in the southeast corner of the allotment. This would likely result in better vegetation cover for this ephemeral channel and the surrounding uplands.

In addition to the grazing monitoring, any juniper project monitoring should be continued. This includes the photo points that were established and any other vegetation or soil monitoring studies. Monitoring of the noxious weed populations should also continue on the allotment."

It is also recommended that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed (UTM coordinates in allotment file). This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential upland rangeland health problems at a level of effort commensurate with this allotment's resource importance.

Pankey Basin Allotment (0884)

Grazing Management: Though 4 out of the 5 Oregon/Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are being met or substantially met on the allotment with current grazing use, the Standard for riparian condition (Standard 2) is not considered met and livestock grazing is the primary cause. It is possible that the creek has reached a point that proper functionality is precluded. The intermingled (with private land) nature of the allotment also does not enhance the possibilities for restoration. However some solutions may be possible. The only way to significantly (or more quickly) improve the conditions along the non-functional portion (0.4 mile) of Pankey Creek is to limit, or possibly exclude, livestock use. This could be accomplished with implementation of one, or a combination, of the following management recommendations:

1. Reduce grazing use on the allotment. Currently the permittee is allowed a total of 39 head from 5/15 to 8/31 (140 AUMs total). Of this total, 12 head (43 AUMs) are for the BLM permit and 27 head (97 AUMs) are an exchange-of-use (EOU) for the unfenced, intermingled private lands leased by the permittee. EOU is a discretionary authorization under the grazing regulations and "…*may be issued…when use under such an agreement will be in harmony with the management objectives for the allotment and will be compatible with the existing livestock operations*…" (43 CFR 4130.6-1(a)). Though EOU does not have to be authorized by the BLM, it is typically done in situations like Pankey Basin, where the private lands are unfenced, are included within the allotment boundary, and are owned/controlled by the allotment permittee. Though the permitted grazing level for the BLM lands appears to be appropriate, the distribution is not. Eliminating the EOU and possibly reducing the BLM permitted use could lead to riparian improvement, but is a comparatively drastic action if pursued solely.

2. Shorten the permitted season of use. The current season of use runs through August 31st. It is the later, hotter portions of the grazing season (i.e. after July 1st or 15th) that cattle typically concentrate in riparian areas. If the season of use were shortened and shifted to 5/1 through 7/15, this would lighten the late season use and possibly lead to incremental improvements in the riparian condition. However, with the AUMs remained the same, more cattle could be run during the shortened season of use possibly negating the benefits. Also, this season-of-use change would apply to the private EOU lands also; a fact that may be contested by the permittee, though the private lands could be fenced separate.

3. Exclosure fence the BLM portion of Pankey Creek. Fencing of the BLM's non-functional portion of the creek is the most positive method to restrict livestock access and bring about condition improvement. Fencing would allow for complete rest for the affecting creek portion, but would shift more impact to the private portions of the creek above the potential exclosure. This upstream impact increase (e.g. sediment input) could negate some of the benefits of the exclosure, though our ultimate responsibility is for the condition of the lands within our administrative authority. If pursued, it is estimated that approximately ¾ mile of fencing would be necessary, and under Oregon BLM policy, would be the maintenance responsibility of the BLM.

4. Fence the BLM separate from the private. This option would make the BLM administered lands a separate and discrete allotment with no EOU needed. It is not BLM policy to fence private/BLM property lines (responsibility of private landowner), though it may be pursued for significant resource reasons. If fenced separately, the maximum grazing use would be the 12 head for the permitted use period. This may or may not be a solution to the riparian condition issue, but would move towards it. Approximately 1½ to 2 miles of fencing would be needed to separate the BLM lands from the Pankey Basin private lands and would be the maintenance responsibility of the grazing permittee.

All the above recommendations have variable benefits and drawbacks, though the quickest, simplest, and possibly most effective solution may be to implement #3. The grazing permittee and actual landowner (different people) would have to be cooperatively involved in whatever solution may be pursued.

Monitoring: Pankey Basin's low priority status and good upland vegetation condition implies that intensive rangeland monitoring studies are not necessary. However, the poor riparian condition stretch of Pankey Creek should be monitored periodically. This would be mandatory if one or more of the management recommendations are implemented in order to ascertain the level of improvement. Adequate monitoring would entail the establishment of one or two fixed riparian photo points, though additional riparian studies could be established if necessary. If riparian exclosure fencing is completed, integrity monitoring would be required and repairs made as necessary. If the riparian area is not fenced separately, and one or more of the other options is pursued, utilization should be read every few years to provide information between cause and effect relative to whatever changes do occur within the Pankey Creek riparian area.

For the upland areas, it is recommended that a Rangeland Health Evaluation Summary Worksheet be prepared periodically (i.e. every 5-10 years) at the same field location that the October 2000 Summary Worksheet was completed (UTM coordinates in allotment file). This includes retaking the view photos. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would help provide early warning of potential upland rangeland health problems at a level of effort commensurate with this allotment's resource importance.

Dry Prairie Allotment (0885)

Grazing Management: The following is quoted from the *Management Recommendations* section of the Dry Prairie Assessment. Since this was a recently completed Assessment, no additional management actions are proposed at this time.

"No changes in grazing management are proposed because the current grazing management is either meeting the Standards, or is making significant progress towards meeting them - where grazing is known to be a resource issue. The current grazing management is also required to be followed under the most recent Biological Opinion (from the ongoing Section 7 consultation) for Dry Prairie.

Juniper reduction should also be pursued in most ecological sites on the Dry Prairie allotment. This needs to be seriously considered if we are to stop the deterioration of conditions on most of the ecological sites in the Gerber Block. Specifically, the following juniper removal or thinning should be considered as listed below (with dominant ecological sites in Dry Prairie listed):

- Virtually all junipers could be removed from the true non-juniper ecological sites (Shallow Stony 10-20", Stony Claypan 14-20"). Non-juniper sites should have 0-1% juniper.
- Most of the younger trees (<100 years) could be removed from the true "old" juniper sites (Juniper Claypan 16-20").
- Reductions to achieve a mix of juniper age classes could be done in the other juniper potential sites (Shrubby Loam 16-20", Mahogany Rockland 10-20"). Composition should reflect amounts allowed in ecological site descriptions.
- Juniper should be brought closer to that described in the ecological site description on the ponderosa pine sites, with all age classes represented as a minor component (Pine-Mahogany-Fescue 16-20", Pine-Sedge-Fescue)."

The above recommendations still hold true and no additional grazing management changes are proposed at this time. The actual grazing system and parameters are outlined in the 1998 Biological Assessment/ Evaluation (and related Biological Opinion) for this allotment.

Monitoring: As an "I" category allotment and as an allotment under Section 7 consultation, Dry Prairie has had a very high level of rangeland monitoring studies established and read. The monitoring system in place has been addressed in the KFRA's monitoring plan and it is recommended that the schedule be followed. This includes utilization readings (points and/or pattern mapping, Cole Browse) every other year, the re-taking of the photo trend point and reading of the frequency trend plot every five years, re-reading the Key Area Condition study as necessary, and the reading of the various riparian monitoring studies. No additional rangeland monitoring studies are deemed necessary at this time.

Horse Camp Rim Allotment (0886)

Grazing Management: Though all 5 Oregon/Washington *Standards for Rangeland Health* and *Guidelines for Livestock Grazing Management* are being met, substantially met, or making significant progress towards being met with current grazing use, the Standard for riparian condition (Standard 2) is considered a qualified "met", with livestock grazing of potential concern. Because of this, the following grazing management is recommended/affirmed (management that is largely as licensed now):

1. Maintain the current five-pasture, rest and/or deferred grazing rotation system. In recent years, the allotment has been grazed with a deferred rotation system, i.e. every pasture is scheduled for use, but on a variable cycle for meeting plant growth requirements. The deferred use has been allowed due to the permittee only running about ½ of the permitted numbers (i.e. 50-75 head instead of the maximum 148 head). With these low numbers, the grazing is light enough that most plants don't get grazed at the same time every year, if at all. In the future, if licensed grazing use is at or near the maximum permitted, the rest-rotation grazing should be adhered to with at least one pasture fully rested each year.

2. The North Spring pasture should be the first pasture used the years that it is included in the grazing rotation, i.e. May 1st through no later than May 24th, depending on the grazing system (see below). This is to enhance/maintain riparian conditions on the Antelope/North Spring drainage. The point of the early on/off dates is to get the cattle in and out quickly during the period when the uplands are about as green and attractive to the cattle as the riparian vegetation. Experience in this area has indicated that with typical May wet riparian conditions, the cattle will select the riparian much less than during June or July. Some years the drainages are flowing through all or a portion of this period, further discouraging grazing use. However, in very dry years this doesn't always hold true.

3. Use one of the following rotation grazing systems as a general guide. All three systems - deferred rotation, modified rest rotation, or rest rotation - are premised on several factors as follows: the North Spring "early use" riparian rationale above; the percentage of the allotment each of the 5 pastures comprises; the high "value" of the Dog Hollow W.S. pasture as the late (July) pasture; and the assumption that water from Dog Hollow Reservoir is available virtually every year for irrigating the Water Spreader (W.S.). (Note: At the time of writing there have been substantial problems with the use of this reservoirs water.) Though the "Modified Rest-Rotation" system is the preferred grazing system, all three should be satisfactory for maintaining/improving vegetation conditions. The approximate percentage that each pasture makes up of the allotment acreage as a whole is in parenthesis following the Year 1 pasture names:

<u>DEFERRED-ROTATION</u>: No full rest years is scheduled for any pastures, but the grazing use for the North Spring pasture is kept the lightest by including Midway W.S. with it. This is a better less-than-full-numbers grazing option (like the past 6 years of grazing use) than with full permitted use. This option entails one more pasture move for the permittee than the other two options, but does spread the grazing use out to the maximum for the allotment as a whole.

<u>Year 1</u>:	North Spring (26.4%)	May 1st to May 21st
	Midway W.S. (7.4%)	May 1st to May 21st *
	Plateau (25.9%)	May 22nd to June 18th
	Rim (21.5%)	June 19th to July 9th
	Dog Hollow W.S. (18.8%)	July 10th to July 31st **
<u>Year 2</u>:	North Spring	May 1st to May 21st
	Midway W.S.	May 1st to May 21st *
	Plateau	June 13th to July 9th
	Rim	May 22nd to June 12th
	Dog Hollow W.S.	July 10th to July 31st **
<u>Year 3</u>:	same as Year 1	
<u>Year 4</u>:	same as Year 2	

<u>MODIFIED REST-ROTATION</u>: This scheme allows full rest for the North Spring pasture once every three years and relatively limited use 2 out of 3 years with the other pastures used on a deferred rotation. This system is slightly preferred over the other two because it allows for the most frequent rest for the North Spring pasture. The trade-off is relatively more use on the other, non-riparian pastures.

<u>Year 1</u>:	North Spring (26.4%)	REST
	Midway W. S. (7.4%)	May 1st to May 10th *
	Plateau (25.9%)	May 11th to June 12th
	Rim (21.5%)	June 13th to July 9th
	Dog Hollow W.S. (18.8%)	July 10th to July 31st **
<u>Year 2</u>:	North Spring	May 1 to May 21st
	Midway W.S.	May 1st to May 21st *
	Plateau	June 13th to July 9th
	Rim	May 22nd to June 12th
	Dog Hollow W.S.	July 10th to July 31st **
<u>Year 3</u>:	North Spring	May 1st to May 21st
	Midway W.S.	May 1st to May 21st *
	Plateau	May 22nd to June 16th
	Rim	June 17th to July 9th
	Dog Hollow W.S.	July 10th to July 31st **

<u>Year 4-6</u>: repeat 3-year cycle above

<u>REST-ROTATION</u>: This is a more traditional, balanced rotation system that includes rest for all the pastures except the irrigated, late use (July) pasture - Dog Hollow Water Spreader.

<u>Year 1</u>:	North Spring (26.4%)	May 1st to May 23rd
	Midway W.S. (7.4%)	May 24th to June 5th *
	Plateau (25.9%)	REST
	Rim (21.5%)	June 6th to July 8th
	Dog Hollow W.S. (18.8%)	July 9th to July 31st **
<u>Year 2</u>:	North Spring	REST
	Midway W.S.	May 1st to May 10th *
	Plateau	May 11th to June 12th
	Rim	June 13th to July 10th
	Dog Hollow W.S.	July 11th to July 31st **
<u>Year 3</u>:	North Spring	May 1st to May 20th
	Midway W.S.	REST
	Plateau	June 9th to July 9th
	Rim	May 21st to June 9th
	Dog Hollow W.S.	July 10th to July 31st **
<u>Year 4</u>:	North Spring	May 1st to May 24th
	Midway W. S.	May 25th to June 5th *
	Plateau	June 6th to July 9th
	Rim	REST
	Dog Hollow W.S.	July 10th to July 31st **

<u>Year 5-8</u>: repeat 4-year cycle above

* The Midway W.S., due to its small size, would generally be grazed in common with the North Spring pasture. This may also help draw some of the cattle use out of the Antelope drainage by spreading the use out into a good forage pasture. Midway still has some residual seeded pasture grass species that are quite lush in the May. However, because of the need for a rest pasture in both Rest-Rotation systems, Midway W.S. would need to be grazed as a discrete pasture occasionally.
** The Dog Hollow W.S. can be grazed every year, under all rotation systems, due to the irrigated seeding being the area that almost all of the pastures grazing takes place in. The uplands in this pasture are typically little used.

4. If future monitoring and evaluation determines that further protection or control is needed on all or a portion of the Antelope/North Spring drainage in order to meet riparian objectives, riparian pasture or exclosure fencing could be pursued. Coordination with the owner of the private land on the creek would be required, since much of the perennially wet riparian is on this parcel.

Monitoring: As an "I" category allotment, this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes utilization readings (points and/or pattern mapping) every three years, the re-taking of the photo trend point and reading of the frequency trend plot every five years, re-reading the Key Area Condition study as necessary, and the reading of the riparian photo points. In addition, the PFC determination should be redone with a team of various, pertinent specialists.

Pitchlog Allotment (0887)

Grazing Management: The following is quoted from the conclusion portions of the Pitchlog Assessment:

"Current Management and Recent Management Changes

The maximum permitted number of cattle that may be grazed is 302 head, which includes 255 head for the public lands permit and an additional 47 head "Exchange-of-Use" (EOU) for the intermingled, unfenced private lands. The permitted season-of-use is 5/10 to 6/30 for a total of 434 AUMs for the public lands and 80 for the private lands EOU.

Livestock management changes in recent years include the implementation of a fenced 4 pasture, rest-rotation system "flash" grazing system which includes the separation of the Pitch Log and Barnes Valley Creeks into their own pasture which is only used early in the season (completed 1994); permanent fence exclusion of a major portion of Pitch Log Creek (1981); and more intensive rangeland monitoring studies on the allotment - both upland and riparian (initiated in 1992). Based on the past 7 years of monitoring studies and field observations, the forage production and conditions within the allotment can accommodate the full permitted use under the current grazing system.

Due to the importance of the NE pasture - which contains this allotments' portion of Barnes Valley Creek - the grazing rotation system is designed to optimize creek and riparian stability and conditions in this pasture, without fencing the creek separately (tried in the past without success). Specifically, the NE pasture will be used in rotation with the other 3 pastures, but will always have the early season of use, i.e. 5/10 to 5/25. Past utilization studies within the allotment, including drought and wet years, have shown that with the growth (and re-growth) that typically occurs after 5/25, utilization made to that date would be more than compensated for by the continuing growth yet to occur. Also, cattle are less inclined to use the riparian areas in May due to both high water levels and the fact that the upland vegetation is as attractive at that time as the riparian plants. Riparian conditions on the drainages in the NE pasture continue to exhibit overall good conditions with upward trends.

Proposed Management Changes

No changes in grazing management are proposed because the current grazing management is either meeting the Standards, or is making significant progress towards meeting them, where grazing is known to be a resource issue. The current grazing management is also required to be followed under the most recent Biological Opinion (from the ongoing Section 7 consultation) for Pitchlog.

The only minor issue, which may be grazing related, is the condition of the Wildhorse meadows. Specific lentic PFC assessments will be completed on these two areas during FY 1999 or FY 2000. These assessments would be done by an interdisciplinary team and may (or may not) reach a different determination than the 1994 assessment. This determination may lead to the proposing of specific management to remedy what problems are thought to exist. This could include fencing the meadows, reclamation of the waterholes, road re-routing, a combination of these or other appropriate remedies, or no changes, depending on the problems found, the probability of rectifying the problem(s), and the priority and importance placed of doing it.

Juniper reduction should also be pursued in most ecological sites on the Pitchlog allotment. This needs to be seriously considered if we are to stop the deterioration of conditions on most of the ecological sites in the Gerber Block. Specifically, the following juniper removal or thinning should be considered as listed below (with dominant ecological sites in Gerber listed):

- *Virtually all juniper could be removed from the true non-juniper ecological sites (Shallow Stony 10-20", Stony Claypan 14-20"). Non-juniper sites should have 0-1% juniper.*
- *Most of the younger trees (<100 years) could be removed from the true "old" juniper sites (Juniper Claypan 16-20").*
- *Reductions to achieve a mix of age classes could be done in the other juniper potential sites (Mahogany Rockland 10-20"). Juniper amounts should reflect amounts allowed in ecological site descriptions.*
- *Juniper should be brought closer to that described in the ecological site description on the ponderosa pine sites, with all age classes represented but as a minor component (Pine-Mahogany-Fescue 16-20", Pine-Sedge-Fescue)."*

The above is still thought to be largely accurate, though the noted lentic PFC assessments have not been done. To further refine the juniper information above (for potential juniper control activities), the noted pine sites should have no more than 1-3% juniper composition if we wish to approximate PNC conditions. The Mahogany Rockland sites should not exceed 2-5% juniper. In addition, some of the concerns expressed for the Wildhorse drainage could also be relevant to Pitch Log Creek. Specifically, the current condition and perceived rate of improvement for the Pitch Log drainage may be of some concern, though a significant portion of the drainage is not BLM administered lands. As noted in Step 5, the ongoing array of monitoring studies should help answer these resource questions over time. If future evaluation of the monitoring information dictates that management needs changed to meet LUP objectives for these areas, such change would be done via the processes required under the grazing regulations (43 CFR Part 4100). Management changes that include the private lands would have to be pursued through cooperative agreements with the landowner(s).

One additional point is useful here relative to the grazing rotation system on the Pitchlog allotment. Recently, acres by allotment for the entire Gerber Block ESI area were accurately tallied via the GIS database. This analysis found that the pastures vary much more in size than previously believed - as follows:

Northeast:	2350 acres (22.5% of the allotment)
Northwest:	1740 acres (16.6% of the allotment)
Southeast:	2130 acres (20.4% of the allotment)
Southwest:	4245 acres (40.5% of the allotment)

Given this wide variation in size, the 4 pasture, rest-rotation system has been recently altered somewhat to reflect an acres weighted allocation of the grazing pressure within the pastures used each year. The grazing rotation system follows:

Year One

Pasture	Preferred Use Period	Maximum Days Use (AUMs)	Earliest Turnout Date	Latest Off Date
NW	REST	-	-	-
SW	6/7 - 6/30	25 (250)	June 3	July 5
SE	5/24 - 6/6	20 (160)	May 19	June 12

Year Two

Pasture	Preferred Use Period	Maximum Days Use (AUMs)	Earliest Turnout Date	Latest Off Date
NW	5/10 – 5/23	20 (160)	May 1	May 28
SW	5/24 – 6/16	25 (250)	May 19	June 21
SE	6/17 – 6/30	20 (160)	June 12	July 5
NE	REST	-	-	-

Year Three

Pasture	Preferred Use Period	Maximum Days Use (AUMs)	Earliest Turnout Date	Latest Off Date
NW	6/15 – 6/30	20 (180)	June 9	July 5
SW	REST	-	-	-
SE	5/26 – 6/14	20 (200)	May 21	June 19
NE	5/10 – 5/25	20 (180)	May 1	May 30

Year Four

Pasture	Preferred Use Period	Maximum Days Use (AUMs)	Earliest Turnout Date	Latest Off Date
NW	6/17 – 6/30	20 (160)	June 12	July 5
SW	5/24 – 6/16	25 (250)	May 19	June 21
SE	REST	-	-	-
NE	5/10 – 5/23	20 (160)	May 1	May 30

Monitoring: As an "I" category allotment, this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes utilization readings (points and/or pattern mapping) every two years, the re-taking of the photo trend point and reading of the frequency trend plot every five years, re-reading the Key Area Condition study as necessary, and the reading of the riparian photo points. In addition, the PFC determinations should be redone with a team of various, pertinent specialists.

Rock Creek Allotment (0888)

Grazing Management: Grazing use on the Rock Creek allotment will follow the recently updated Warm Spring CRMP, which centers on a grazing system designed in coordination with the neighboring Modoc and Fremont National Forest lands. Some past monitoring along Rock Creek has shown utilization in the riparian area that has occasionally exceeded RMP standards. The riparian utilization points should be monitored on an annual basis and near the end of the current year's growth period. If chronic overuse were to occur, then further management actions may have to be pursued. Juniper reduction/control should also be pursued in many of the ecological sites on the allotment. The Timber Hill allotment juniper control recommendations below are equally pertinent to Rock Creek as the two allotments are immediately adjacent to each other.

Monitoring: As a high priority "C" category allotment (with past "I" category status), this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes upland utilization readings (points and/or pattern mapping) every five years, the re-taking of the photo trend points every five years, re-reading the Key Area Condition study as necessary, and the reading of the riparian photo points every five years. In addition, the PFC determinations should be redone with a team of various, pertinent specialists.

Timber Hill Allotment (0889)

Grazing Management: (The following is quoted from the *Management Recommendations* section of the Timber Hill Assessment.)

"No changes in grazing management are proposed because the current grazing management is either meeting the Standards, or is making significant progress towards meeting them - where grazing is known to be a resource issue.

Juniper reduction/control should be pursued in most ecological sites on this allotment. This needs to be seriously considered if we are to stop the deterioration of conditions on most of the ecological sites in the Gerber Block. Specifically, the following juniper removal or thinning should be considered as listed below (with dominant ecological sites in the Timber Hill allotment listed):

- *Virtually all juniper could be removed from the true non-juniper ecological sites (Shallow Stony 10-20", Stony Claypan 14-20"). These non-juniper sites should have 0-1% junipers.*
- *Most of the younger trees (<100 years) could be removed from the true "old" juniper sites (Juniper Claypan 12-16", Juniper Claypan 16-20").*
- *Reductions to achieve a mix of age classes could be done in the other juniper potential sites (Juniper-Pine-Bunchgrass 12-16"). Juniper amounts should reflect amounts allowed in ecological site description.*
- *Juniper should be brought closer to that described in the ecological site description on the ponderosa pine sites, with all age classes represented but as a minor component (Pine-Mahogany-Fescue 16-20", Pine-Sedge-Fescue)."*

The above is still thought to be accurate. To further refine the juniper information above (for potential juniper control activities), the noted pine sites should have no more than 1-3% juniper composition if we wish to approximate PNC conditions. The Juniper-Pine-Bunchgrass sites (now called "Juniper Dry Pine 14-16") should not exceed 10% juniper.

Monitoring: As an "I" category allotment, this allotment has been addressed in the KFRA's monitoring plan and it is recommended that the existing monitoring schedule be followed. This includes utilization readings (points and/or pattern mapping) every three years, the re-taking of the photo trend point and reading of the frequency trend plot every five years, and the re-reading the Key Area Condition study done as necessary.

Willow Valley Allotment (0890)

Grazing Management: The following is quoted directly from the *Management Recommendations* section of the Willow Valley Assessment. Since the Assessment was done recently, there are no additional management recommendations to be made at this time.

Grazing System - A rest rotation system should be maintained to permit periodic rest, which allows for the recruitment of new seedlings, enhancement of plant vigor, and the building of root reserves for future seed production. Deferred grazing in a pasture after the rest year should also be used where practical to allow a better chance for new seedling establishment. The season of use of 4/15 to 6/30 should be maintained, but flexibility should be allowed based upon the current year's climatic conditions and the needs of the permittees.

Pasture AUM allocations - Allocation of AUMs for each pasture is based on several factors:
- Utilization monitoring from past years adjusted for precipitation
- Production data from ESI surveys
- Condition data from ESI surveys
- Soil erosion and observed apparent trend portions of the ESI data
- Utilization pattern mapping from past years
- Professional judgment and knowledge of the allotment

Willow Valley Chaining Pasture - The chained and seeded portion of the pasture is supporting a good stand of introduced species. Monitoring and ESI data for the rest of this pasture shows that the vegetation communities are in mid to late seral ecological status, but overall production is low. There are also areas that are heavily invaded by undesirable grass species and weedy forbs. Livestock use has been mainly in the seeded portion of the pasture with light use in the native portions of the pasture, mainly near waterholes. Based on this, utilization should be set at 40% to allow more of the native perennials to produce seed and increase in vigor. This will also allow for more organic material to be left resulting in better soil protection and water infiltration.

Using 1992, 94, 95, & 98 utilization and actual use monitoring data, the following formula was used to determine a stocking rate: X = Actual Use x Desired Utilization?/Actual Utilization where X = Desired Capacity. The mean figure for the four years was 442 AUMs.

Woolen Canyon Pasture - This pasture is in the poorest condition of all the pastures. Monitoring and ESI data show low production throughout the pasture and many areas invaded by undesirable grass species and weedy forbs. Junipers have increased to a level in many areas where they are negatively affecting the vegetation communities. There is also a stretch of Antelope Creek that was rated as nonfunctional due to heavy livestock impacts. Based on the low production levels and the large areas in only fair condition, utilization should be set at 30%. This will allow for less use on the native perennials, giving them a chance to increase in vigor, establish root reserves, and produce seed. This will also help lessen the impacts on Antelope Creek.

Using 1993, 94, & 97 utilization and actual use monitoring data, the following formula was used to determine a stocking rate: X = Actual Use x Desired Utilization?/Actual Utilization, where X = Desired Capacity. The mean figure for the three years was 304 AUMs.

Notch Corral Pasture - This pasture has the best condition in the allotment and has had good livestock distribution. ESI condition data show areas of late seral and PNC vegetation with good production levels in some areas and lower than average in others. Junipers are increasing in many areas and may begin to affect the vegetation community structure. Based on these factors, utilization should be set at 50% to maintain and/ or improve the vegetation conditions.

Using 1993, 95, 97, & 98 utilization and actual use monitoring data, the following formula was used to determine a stocking rate: X = Actual Use x Desired Utilization/?Actual Utilization, where X = Desired Capacity. The mean figure for the four years was 573 AUMs.

Antelope Pasture - This pasture has two large reservoirs, which tend to concentrate the livestock use. Use mapping shows moderate to heavy use in the areas around the reservoirs and along the drainages below the reservoirs. Better distribution of the livestock is needed which will be addressed under Pasture Rotation below. The ESI condition data shows vegetation to be in late seral and PFC vegetation. Production levels vary from below average to average. Based on these factors, utilization should be set at 50% to help maintain and/or improve the vegetation conditions.

Using 1993, 95, 97, & 98 utilization and actual use monitoring data, the following formula was used to determine a stocking rate: X = Actual Use x Desired Utilization?/Actual Utilization, where X = Desired Capacity. The mean figure for the four years was 231 AUMs.

Antelope Riparian Pasture - This pasture was designed to maintain and improve wetland habitat. Its use by livestock should continue to be limited. No separate AUMs will be assigned to this pasture. It should only be used for a 10-day period concurrent with use in the adjoining Antelope Pasture.

AUM Summary and Grazing System - The combined total of the AUM figures for the individual pastures would be 1550 AUMs for the allotment. In order to implement an effective rest rotation system, a reduction in this total must be figured. Only 3 of the 4 main pastures will be used in any year, so a reasonable number of AUMs should be deducted to insure that utilization levels are not greatly exceeded on the use pastures. With a rest rotation system, the desired utilization levels in a pasture could be exceeded during one or two of the use years considering that it will be rested every fourth year. The RMP allowable use guideline for upland utilization is 50%. The levels recommended above for individual pastures vary from 30% to 50%. Actual field utilization may exceed 50% at any given utilization point in any given year depending upon livestock use patterns, available water sources, etc. But the long-term goal of the recommended AUM levels is an improvement in the resources in the individual pastures and in the allotment as a whole.

With this in mind, the current AUM allocation for the allotment is 1320 AUMs with 120 AUMs temporarily suspended. This results in an active use level of 1200 AUMs. Using this AUM level in a four pasture rest rotation system would result in some utilization that could be higher than the desired utilization levels. This would occur in the smaller pastures, Woolen Canyon and Antelope, during years when the larger pastures, Notch Corral and Willow Valley Chaining, are rested. With a rest rotation system, these slightly higher use levels are balanced by the rest years. The larger pastures also receive some higher use levels during the rotation, but these are also balanced during rest years and when the smaller pastures are rested.

One of the operators, Dennis Hitt, normally does not bring livestock onto the allotment until early to mid May. Also, there are concerns about the operators' different livestock breeding programs. Anderson breeds for fall calving and Hitt and Johnson Stock breed for spring calving. Due to this difference and the late turn on by Hitt, a rotation that keeps Hitt's livestock separate from the others is being proposed.

The following is the proposed pasture rotation using the 1200 AUM level. This is based on the season of use of 4/15 to 6/30 for 294 head of Anderson cattle and 36 head of Johnson Stock cattle. Hitt's season of use is 5/10 - 6/30 with 213 head of cattle. All pastures receive rest for one year out of four except for the Willow Valley Chaining pasture. One year out of four it will receive very light use in the spring (63 AUMs). The Willow Valley Chaining pasture is the most convenient one to use as the first pasture every year due to its proximity to the permittee's private lands. It also has soil types that dry out earlier in the spring allowing for fewer problems associated with wet soils. The Antelope Riparian pasture will be used one year out of four and in conjunction with use on the Antelope pasture.

Willow Valley Allotment - Proposed Pasture Rotation

Pasture	Season of Use (Operator)* [AUMs]			
	Year 1	Year 2	Year 3	Year 4
Willow Valley Chaining	4/15-5/28 (A& JS) [477]	4/15-5/31 (A& JS) [510]	5/10-5/18 (H) [63]	5/10-6/30 (H) [364]
Woolen Canyon	REST	6/1-6/30 (A& JS) [325]	5/19-6/30 (H) [300]	4/15-5/11 (A&JS) [293]
Notch Corral	5/10-5/28 (H) 5/29-6/30 (A& JS) [491]	REST	4/15-6/8 (A& JS) [597]	5/12-6/30 (A& JS) [542]
Antelope	5/29-6/30 (H) [231]	5/20-6/30 (H) [294]	6/9-6/30 (A& JS) [239]	REST
Antelope Riparian	REST	5/10-5/19 (H) [70]	REST	REST

*A = John Anderson, JS = Johnson Stock, H = Hitt AUM figures are based upon use by the following numbers of livestock: Anderson - 294, Johnson Stock - 36, Hitt - 213.

This pasture rotation and AUM level should be used for two full cycles, eight years, and then reevaluated. Utilization mapping should be completed on an annual basis and utilization point monitoring should be completed annually for the first full rotation.

<u>Range Improvements</u>

- An updated range improvement maintenance agreement should be developed with the current permittees. Recent changes in ownership and levels of use make this necessary. A new agreement for the Antelope Riparian pasture also needs to be developed due to the ownership changes.
- A complete inventory of existing waterholes and springs should be done to determine any maintenance or repair needs. Several of the waterholes are in need of cleaning to restore their storage capacity. Exclosure fences around the springs and some of the waterholes are also in need of repairs. These maintenance needs will be coordinated with the permittees.
- An inventory of the condition of the allotment boundary and pasture fences should also be completed. This could be done in cooperation with the permittees.

Juniper control options should be looked at for many areas in the allotment, especially those ecological sites that would naturally have little or no juniper as a component.
- A request has been made by one of the permittees to fence separately the east end of the Antelope Riparian pasture. The fence would separate the wetland area on the west from the upland vegetation on the east end. This new area on the east end would be combined with private land to the north to create a gathering pasture. This would allow the permittee a place to gather his livestock on the moves to and from the Bear Valley allotment.
- The upper section of Antelope Creek that has been rated as Nonfunctioning may need to be fenced to exclude livestock if conditions do not improve with the new pasture rotation system that will be implemented. The need for fencing will be determined by the additional monitoring that will be implemented as outlined in the <u>Monitoring</u> section below.

Resource Objectives **-** The current RMP objectives for this allotment need to be made more specific to the resources present. The objectives need to be clear and quantifiable statements of desired values to be achieved within a stated time period. The ESI data provides a good basis for setting desired vegetation community objectives. Riparian and water quality objectives should be specific to the riparian resources present in the allotment. These objectives should be developed as an interdisciplinary process with input from the permittees and other interested agencies and publics.

Wildlife Allocation - The current AUM allocation for wildlife, 960 AUMs for deer and 141 AUMs for antelope, should remain the same. All monitoring studies incorporate the use made by wildlife and livestock. When utilization monitoring results show use above the desired levels, livestock allocations are adjusted. This in turn provides the wildlife with additional forage. Cole Browse studies have consistently shown very little use by livestock of shrub species that wildlife are dependent on. There is a building population of elk in this area. As the population develops and use patterns become more established, allocations may be made for this elk herd.

Monitoring: The current range monitoring program should be continued with a few changes and additions. As noted above, use mapping and utilization point monitoring will be completed on an annual basis to determine the effectiveness of the management changes. Increased use supervision will also be done in the allotment to provide data on livestock distribution and numbers. Actual use data will continue to be recorded by the permittees.

- The key management areas and utilization points need some field review to determine their adequacy in representing the current conditions and grazing patterns. This will be done during monitoring visits.
- The section of Antelope Creek that was rated as Nonfunctional should have additional annual monitoring to determine if the changes in the grazing management are resulting in a decrease in livestock use and in increase in riparian conditions. This monitoring will include weekly observations of livestock use during the use period for Woolen Canyon pasture, end of the season Streambank Stability ratings, and continuance of the Riparian Photo Points on an annual basis.

The drainage below Antelope Reservoir should be considered for a monitoring point.
The photo trend plots should be continued.

- A vegetation species "map" similar to the ones prepared in the 70's and early 80's should be completed for the plots. This would help with species identification in the plots.

William's Allotment (0892)

Grazing Management: It is recommended that the current grazing management be continued without change (see Step 3 narrative). The Yainax Butte CRMP (of which this allotment is a part of) was revised in recent years and appears to be largely followed and functioning. The CRMP revision was considered an allotment evaluation and found that there was no specifically identified grazing related resource problems on the allotment, though the BLM administered lands are an extremely minor component (~6%) of the overall CRMP area for which the grazing is administered principally by the USFS. The current grazing season of use and levels appear to be appropriate based on current information. As noted in Step 5, the *Rangeland Health Standards Assessment* for this allotment is scheduled for completion in 2003 and not as part of this analysis. The resource information and analyses in this document will be a major reference when preparing that Assessment.

Monitoring: As an "M" category allotment, Williams has been addressed in the KFRA's monitoring plan, though no formal studies have as yet been implemented. Casual observations indicate that the allotment is in good condition and whatever grazing does occur, is benign. It is recommended that a Rangeland Health Evaluation Summary Worksheet(s) be prepared for this allotment during the late summer or fall of 2002. This qualitative assessment process is outlined in BLM Technical Reference 1734-6 and would provide ecological and watershed function information for the Assessment. It could also provide early warning of potential rangeland health problems and potentially help point out if more monitoring studies are needed. The Assessment when prepared would identify if any additional monitoring needs implemented.

NFS Administered Lands - Fremont National Forest

Recommendations in this section will be generalized for all allotments. More site-specific recommendations will be executed as part of the range analysis performed in the scheduled years (see discussion in *Step 5 - Non-forested Upland* section).

Maintain current improvements to promote continued successful grazing programs. Identify and prioritize areas of poor livestock distribution and continue to make range improvements (fences, water improvements, livestock holding areas, etc) to obtain good livestock distribution and proper use of available forage when necessary. Optimize the most appropriate grazing strategy for the allotment to promote range health.

KNOWN DATA GAPS:

- Update long-term monitoring data.
- Obtain ecological status generalizations on an allotment basis.
- Update allotment management plans to current goals and accomplishments.

Recreation

Management recommendations are found on pages 47-53 of the RMP/ROD. Recommendations are both general and specific to the Gerber area. Specific recommendations include the following: "Continue to manage Gerber Recreation site with camping units to accommodate overnight, day use and mobility impaired visitors; frog camp day use area; and boat ramps. Manage several nearby semi-developed camp sites to provide primitive camping and day use. Manage and maintain the Gerber Watchable Wildlife area tour. In addition, develop or enhance watchable wildlife and other interpretive sites to showcase resource management. Manage area for roaded natural and semi-primitive recreation opportunities."

The Miller Creek trail is also mentioned, "Maintain ¼-mile long, for hiking and horseback use, for semi-primitive non-motorized use. Pursue development of additional trail along Miller Creek Canyon."

Off –highway vehicle (OHV) use is to be "limited to existing roads and trails" in the "Gerber Block, (including the Gerber recreation site)." In addition, a seasonal off-highway vehicle use limitation is in place for the Gerber Block from November 1-April 15. The Miller Creek ACEC and Gerber Reservoir (up to the high water mark) are closed to OHVs. OHV designations are shown on RMP/EIS map 2-9

In addition to the existing developed and semi-developed recreation sites in the Gerber area, the RMP/ROD calls for developing "potential recreation sites and trails as funding and/or recreation partnerships becomes available and if development is consistent with other land use objectives and allocations." These sites (located on smaller reservoirs) and trails are shown on map 2-8 and 2-10 of the RMP.

Since the RMP was completed in 1995, the BLM has undertaken a concerted effort and expended considerable funds to maintain or improve the existing recreation facilities in the Gerber area. The purpose for these improvements have been several fold: to enhance the visitor experience by providing attractive, well laid-out facilities; to reduce long term maintenance needs by replacing or updating old or failing facilities; to continue to attract visitors and campground hosts seeking a high quality recreation experience; to reduce environmental hazards from campground road dust; and reduce or eliminate the interaction and spoils of grazing livestock; to improve riparian condition; to improve handicap accessibility to facilities.

The potential recreation site at Willow Valley Reservoir was developed in late 2002 with Marine Board grant funding assistance. A new boat ramp, parking area and vault toilet have been installed.

Proposed management changes

Future management of recreation in the Gerber area is primarily dependent on visitor demand and future funding. Existing supply for camping and day use facilities is adequate except on a few weekends or holidays. If the fisheries and fishing success by visitors in Gerber reservoir improves dramatically in the future, then additional facilities may need to be constructed to meet this demand. A horse camp facility located between the north and south Gerber campgrounds should be considered to tie-in with the proposed Gerber Potholes trail. An additional boat ramp is needed at the South campground, to replace the one that was removed in the early 1990s. The Barnes Valley boat ramp needs to be replaced soon as concrete portion is failing. The meadow adjacent to the road maintenance/fire engine pond located on the Fremont Forest in Sec. 21, T. 39 S., R. 12 E is receiving some OHV damage. Some vehicle barriers should be installed to prevent damage to the meadow.

If the proposal to raise Gerber dam is implemented, the facilities and roads at north and south Gerber campground, Stan H. Spring, Frog camp and Barnes Valley Creek will need to be relocated or replaced with equivalent or better structures in similar forest settings. One of the primary attractions to camping in these areas is the majestic pines and the inherent shade and scenic enhancement they provide. It is important to maintain the existing character of these campsites when considering relocating or replacement.

Cultural Resources

In order to ensure that the trust responsibilities of the Fremont National Forest to the Klamath Tribes are fully met within the Gerber/Willow Valley watershed it is recommended that the consultation procedures, as defined in the February 19, 1999 MOA be incorporated in all Fremont National Forest project planning. Specifically, for the 1025-acre portion of the watershed that falls within the former reservation boundary, include the Klamath Tribes in the initiation, development, and implementation stages of all management decisions which have the potential to impact the Interstate Mule Deer herd, downstream fish populations in the Klamath Basin, and cultural resources or other treaty rights resources where applicable along the northern boundary of the watershed.

Although treaty rights are no longer federally recognized in the Gerber/Willow Valley area outside of the former reservation boundary, the Klamath Tribes remain concerned about the management and potential disturbance to cultural sites in the area. Efforts should continue to keep the Klamath Tribes informed of federal agency activities. (RMP/ROD 1994: pp39-40)

The BLM is committed to coordinating with the Tribes. Presently, the Tribal cultural staff and the BLM cultural staff meet bi-monthly. Such consultation, or something like it, should continue into the future per regulation (Executive Memorandum of April 29, 1994; Executive Order 13084 of May 14, 1998; and BLM Manual Handbook H-8160-1).

Efforts should continue to fulfill federal responsibilities to the Tribes regarding heritage and religious concerns (RMP/ROD 1994: pp39-40). Management should continue to maintain vegetative resources for Tribal use.

Cultural resource site conditions should be monitored for unauthorized excavation and collection, as well as for other disturbance processes. Once impacts are assessed, more informed and cost effective decisions (such as possibly stepping up law enforcement patrols) can be made to minimize and/or prevent further damage. (RMP/ROD 1994: pp39-40)

Monitoring for mitigation effectiveness should also be implemented to ensure that cultural resources are being addressed and adequately protected in pre-planning processes. Regulations require a responsible and good faith effort to identify cultural properties and take into account any effect an undertaking may have on those resources (Section 106 and 110(a)(2)(E) of the National Historic Preservation Act [NHPA] and 36 CFR Part 800). Existing cultural surveys may not meet current professional standards. Today investigators use a new automated Oregon SHPO site data system, aerial photography, and Global Positioning System (GPS) technology. The effectiveness of the older surveys and/or more recent surveys should be analyzed. If these surveys do not meet current standards, then a new survey should be conducted when new ground disturbing activities are proposed.

APPENDIX A - WILDLIFE SPECIES LIST

Summary of wildlife species/status known or thought to occur in the Gerber and Willow Valley watersheds. List derived from wildlife sightings database, biological survey information, incidental sightings and literature. (*Indicates listing only if breeding population)

Common Name	Scientific Name	BLM Status	Federal Status	State Status	ONHP Status	Presence
Mammals						
Preble's Shrew	*Sorex preblei*	BT	SoC		4	Likely present
Vagrant Shrew	*Sorex vagrans*					Likely present
Water Shrew	*Sorex palustris*					Likely present
Trowbridge's Shrew	*Sorex trowbridgii*					Likely present
Merriam's Shrew	*Sorex merriami*					Likely present
Broad-footed Mole	*Scapanus latimanus*					Likely present
California Myotis	*Myotis californicus*					Likely present
Yuma Myotis	*Myotis yumanensis*	BTO	SoC		4	Likely present
Little Brown Myotis	*Myotis lucifugus*					Likely present
Long-legged Myotis	*Myotis volans*	BT	SoC	SU	4	Likely present
Long-eared Myotis	*Myotis evotis*	BT	SoC	SU	4	Likely present
Silver-haired Bat	*Lasionycterus noctivagans*	BTO	SoC	SU	4	Yes
Big Brown Bat	*Eptesicus fuscus*					Likely present
Hoary Bat	*Lasiurus cinereus*				4	Likely present
Townsend's Big-eared Bat	*Corynorhinus townsendii*	BSO	SoC	SC	2	Likely present
Pallid Bat	*Antrozous pallidus*	BT		SV	3	Likely present
Pygmy Rabbit	*Brachylagus idahoensis*	BAO	SoC	SV	2	Likely present
Mountain Cottontail	*Sylvilagus nuttallii*					Yes
Snowshoe Hare	*Lepus americanus*					Yes
White-tailed Jackrabbit	*Lepus townsendii*	BTO		SU	4	Likely present
Black-tailed Jackrabbit	*Lepus californicus*					Yes
Least Chipmunk	*Tamias minimus*					Yes
Allen's Chipmunk	*Tamias senex*					Likely present
Yellow-bellied Marmot	*Marmota flaviventris*					Yes
Belding's Ground Squirrel	*Spermophilus beldingi*					Yes
California Ground Squirrel	*Spermophilus beecheyi*					Yes
Golden-mantled Gr. Squirrel	*Spermophilus lateralis*					Yes
Western Gray Squirrel	*Sciurus griseus*	BTO		SU	3	Yes
Douglas' Squirrel	*Tamiasciurus douglasii*					Yes
Northern Flying Squirrel	*Glaucomys sabrinus*					Likely present
Northern Pocket Gopher	*Thomomys talpoides*					Likely present
Western Pocket Gopher	*Thomomys mazama*					Yes
Great Basin Pocket Mouse	*Perognathus parvus*					Likely present
California Kangaroo Rat	*Dipodomys californicus*					Yes
American Beaver	*Castor canadensis*					Yes
Western Harvest Mouse	*Reithrodontomys megalotis*					Likely present
Deer Mouse	*Peromyscus maniculatus*					Yes
Northern Grasshopper Mouse	*Onychomys leucogaster*					Likely present
Dusky-footed Woodrat	*Neotoma fuscipes*					Yes
Bushy-tailed Woodrat	*Neotoma cinerea*					Yes
Heather Vole	*Phenacomys intermedius*					Likely present
Montane Vole	*Microtus montanus*					Yes
Long-tailed Vole	*Microtus longicaudus*					Likely present
Sagebrush Vole	*Lemmiscus curtatus*					Likely present
Muskrat	*Ondatra zibethicus*					Yes

House Mouse	*Mus musculus*					Yes
Western Jumping Mouse	*Zapus princeps*					Likely present
Common Porcupine	*Erethizon dorsatum*					Yes
Coyote	*Canis latrans*					Yes
Gray Fox	*Urocyon cinereoargenteus*					Yes
Red Fox	*Vulpes vulpes*					Likely present
Black Bear	*Ursus americanus*					Yes
Ringtail	*Bassariscus astutus*	BTO		SU	4	Likely present
Common Raccoon	*Procyon lotor*					Yes
American Marten	*Martes americana*	BTO	SV	4		Yes
Ermine	*Mustela erminea*					Likely present
Long-tailed Weasel	*Mustela frenata*					Yes
Mink	*Mustela vison*					Yes
American Badger	*Taxidea taxus*					Yes
Western Spotted Skunk	*Spilogale gracilis*					Yes
Striped Skunk	*Mephitis mephitis*					Yes
Northern River Otter	*Lutra canadensis*					Yes
Mountain Lion	*Felis concolor*					Yes
Bobcat	*Lynx rufus*					Yes
Rocky Mountain Elk	*Cervus elaphus*					Yes
Mule Deer	*Odocoileus hemionus*					Yes
Pronghorn	*Antilocapra americana*					Yes
Birds						
American Avocet	*Recurvirostra americana*					Yes
American Bittern	*Botaurus lentiginosus*					Likely present
American Coot	*Fulica americana*					Yes
American Crow	*Corvus brachyrhynchos*					Yes
American Kestrel	*Falco sparverius*					Yes
American Peregrine Falcon	*Falco peregrinus anatum*		SEO	LE	2	Yes
American Robin	*Turdus migratorius*					Yes
American White Pelican	*Pelecanus erythrorhynchos*	BAO		SV	2	Yes
American Wigeon	*Anas americana*					Yes
Ash-throated Flycatcher	*Myiarchus cinerascens*					Yes
Bald Eagle	*Haliaeetus leucocephalus*	FT	LT	LT	2	Yes
Bank Swallow	*Riparia riparia*					Yes
Barn Owl	*Tyto alba*					Yes
Barn Swallow	*Hirundo rustica*					Yes
Barrow's Goldeneye	*Bucephala islandica*	BTO*	SU*	4*		Yes
Belted Kingfisher	*Ceryle alcyon*					Yes
Bewick's Wren	*Thryomanes bewickii*					Yes
Black Tern	*Chlidonias niger*	BT*	SoC*		4*	Yes
Black-backed Woodpecker	*Picoides arcticus*	BSO		SC	4	Yes
Black-billed Magpie	*Pica pica*					Yes
Black-chinned Hummingbird	*Archilochus alexandri*					Likely present
Black-crowned Night-Heron	*Nycticorax nycticorax*					Yes
Black-headed Grosbeak	*Pheucticus melanocephalus*					Yes
Black-necked Stilt	*Himantopus mexicanus*					Yes
Blue Grouse	*Dendragapus obscurus*					Yes
Brewer's Blackbird	*Euphagus cyanocephalus*					Yes
Brewer's Sparrow	*Spizella breweri*					Yes
Brown Creeper	*Certhia americana*					Yes
Brown-headed Cowbird	*Molothrus ater*					Yes
Bufflehead	*Bucephala albeola*	BAO*		SU*	4*	Yes
Bullock's Oriole	*Icterus bullockii*					Yes
Bushtit	*Psaltriparus minimus*					Yes
California Gull	*Larus califonicus*					Yes

California Quail	*Callipepla californica*					Yes
Calliope Hummingbird	*Phalaenoptilus nuttallii*					Yes
Canada Goose	*Branta canadensis*					Yes
Canvasback	*Aythya valisineria*					Yes
Cassin's Finch	*Carpodacus cassinii*					Yes
Cassin's Vireo	*Vireo cassinii*					Yes
Cedar Waxwing	*Bombycilla cedrorum*					Yes
Chipping Sparrow	*Spizella passerina*					Yes
Cinnamon Teal	*Anas cyanoptera*					Yes
Clark's Nutcracker	*Nucifraga columbiana*					Yes
Cliff Swallow	*Petrochelidon pyrrhonota*					Yes
Common Goldeneye	*Bucephala clangula*					Yes
Common Merganser	*Mergus merganser*					Yes
Common Nighthawk	*Chordeilus minor*					Yes
Common Poorwill	*Phalaenoptilus nuttallii*					Yes
Common Raven	*Corvus corax*					Yes
Common Snipe	*Gallinago gallinago*					Yes
Cooper's Hawk	*Accipiter cooperi*					Yes
Dark-eyed Junco	*Junco hyemalis*					Yes
Double-crested Cormorant	*Phalacrocorax auritus*					Yes
Downy Woodpecker	*Picoides pubescens*					Yes
Dusky Flycatcher	*Empidonax oberholseri*					Yes
European Starling	*Sturnus vulgaris*					Yes
Evening Grosbeak	*Coccothraustes vespertinus*					Yes
Flammulated Owl	*Otus flammeolus*	BSO		SC	4	Likely present
Ferruginous Hawk	*Buteo regalis*	BSO*	SoC*	SC*	2*	Yes
Forster's Tern	*Sterna foresteri*					Yes
Fox Sparrow	*Passerella iliaca*					Yes
Gadwall	*Anas strepera*					Yes
Golden Eagle	*Aquila chrysaetos*					Yes
Golden-crowned Sparrow	*Zonotrichia atricapillla*					Yes
Golden-crowned Kinglet	*Regulus satrapa*					Yes
Gray Flycatcher	*Empidonax wrightii*					Yes
Gray Jay	*Perisoreus canadensis*					Yes
Great Blue Heron	*Ardea herodias*					Yes
Great Egret	*Ardea alba*					Yes
Great Gray Owl	*Strix nebulosa*	BT*		SV*	4*	Yes
Great-horned Owl	*Bubo virginianus*					Yes
Greater Sandhill Crane	*Grus canadensis tabida*	BTO*		SV*	4*	Yes
Greater White-fronted Goose	*Anser albifrons*					Yes
Green-tailed Towhee	*Pipilo chlorurus*					Yes
Green-winged Teal	*Anas crecca*					Yes
Hairy Woodpecker	*Picoides villosus*					Yes
Hammond's Flycatcher	*Empidonax hammondii*					Yes
Hermit Trush	*Catharus guttatus*					Yes
Hooded Merganser	*Lophodytes cucullatus*					Yes
Horned Lark	*Eremophila alpestris*					Yes
House Finch	*Carpodacus mexicanus*					Yes
House Wren	*Troglodytes aedon*					Yes
Juniper Titmouse	*Baeolophus ridgwayi*					Yes
Killdeer	*Charadrius vociferus*					Yes
Lark Sparrow	*Chondestes grammacus*					Yes
Lazuli Bunting	*Passerina amoena*					Yes
Lesser Goldfinch	*Carduelis psaltria*					Yes
Lesser Scaup	*Aythya affinis*					Yes
Lincoln's Sparrow	*Melospiza lincolnii*					Yes
Loggerhead Shrike	*Lanius ludovicianus*					Likely present

Long-eared Owl	*Asio otus*					Likely present
Macgillivray's Warbler	*Oporornis tolmiei*					Yes
Mallard	*Anas platyrhynchos*					Yes
Merlin	*Falco columbarius*	BAO*			2*	Yes
Mountain Bluebird	*Sialia currucoides*					Yes
Mountain Chickadee	*Poecile gambeli*					Yes
Mountain Quail	*Oreortyx pictus*	BTO	SoC	SU	4	Yes
Mourning Dove	*Zenaida macroura*					Yes
Nashville Warbler	*Vermivora ruficapilla*					Yes
Northern Flicker	*Colaptes auratus*					Yes
Northern Goshawk	*Accipiter gentilis*	BSO	SoC	SC	2	Yes
Northern Harrier	*Circus cyaneus*					Yes
Northern Pintail	*Anas acuta*					Yes
Northern Pygmy Owl	*Glaucidium gnoma*					Yes
N. Rough-winged Swallow	*Stelgidopteryx serripennis*					Yes
Northern Saw-whet Owl	*Aegolius acadicus*					Yes
Northern Shoveler	*Anas clypeata*					Yes
Olive-sided Flycatcher	*Contopus cooperi*	BTO	SoC	SV	4	Yes
Orange-crowned Warbler	*Vermivora celata*					Yes
Osprey	*Pandion haliaetus*					Yes
Pied-billed Grebe	*Podilymbus podiceps*					Yes
Pileated Woodpecker	*Dryocopus pileatus*	BT		SV	4	Yes
Pine Siskin	*Carduelis pinus*					Yes
Pinyon Jay	*Gymnorhinus Cyanocephalus*					Yes
Prairie Falcon	*Falco mexicanus*					Yes
Purple Finch	*Carpodacus purpureus*					Yes
Pygmy Nuthatch	*Sitta pygmaea*	BTO		SC/SV	4	Yes
Red Crossbill	*Loxia curvirostra*					Yes
Red-breasted Nuthatch	*Sitta canadensis*					Yes
Red-breasted Sapsucker	*Sphyrapicus ruber*					Yes
Redhead	*Aythya americana*					Yes
Red-naped Sapsucker	*Sphyrapicus nuchalis*					Yes
Red-tailed Hawk	*Buteo jamaicensis*					Yes
Red-winged Blackbird	*Agelaius phoeniceus*					Yes
Ring-billed Gull	*Larus delawarensis*					Yes
Ring-necked Duck	*Aythya collaris*					Yes
Rock Dove	*Columba livia*					Yes
Rock Wren	*Salpinctes obsoletus*					Yes
Ross's Goose	*Chen rossii*					Yes
Rough-legged Hawk	*Buteo lagopus*					Yes
Ruby-crowned Kinglet	*Regulus calendula*					Yes
Ruffed Grouse	*Bonasa umbellus*					Yes
Ruddy Duck	*Oxyura jamaicensis*					Yes
Rufous Hummingbird	*Selasphorus rufus*					Yes
Savannah Sparrow	*Passerculus sandwichensis*					Yes
Sharp-shinned Hawk	*Accipiter striatus*					Yes
Snow Goose	*Chen caerulescens*					Yes
Song Sparrow	*Melospiza melodia*					Yes
Sora	*Porzana carolina*					Yes
Spotted Sandpiper	*Actitis macularia*					Yes
Spotted Towhee	*Pipilo maculatus*					Yes
Stellar's Jay	*Cyanocitta stelleri*					Yes
Swainson's Hawk	*Buteo swainsoni*	BT*		SV*	4*	Yes
Swainson's Thrush	*Catharus ustulatus*					Yes
Townsend's Solitaire	*Myadestes townsendi*					Yes
Tree Swallow	*Tachycineta bicolor*					Yes
Tundra Swan	*Cygnus columbianus*					Yes

Turkey Vulture	*Cathartes aura*					Yes
Varied Trush	*Ixoreus naevius*					Yes
Vesper Sparrow	*Pooecetes gramineus*					Yes
Violet-green Swallow	*Tachycineta thalassina*					Yes
Warbling Vireo	*Vireo gilvus*					Yes
Western Bluebird	*Sialia mexicana*					Yes
Western Grebe	*Aechmophorus occidentalis*					Yes
Western Flycatcher	*Empidonax difficilis/occidentalis*					Yes
Western Kingbird	*Tyrannus verticalis*					Yes
Western Meadowlark	*Sturnella neglecta*					Yes
Western Sage Grouse	*Centrocercus urophasianus phaios*	BAO	SoC	SV	1	Yes
Western Screech Owl	*Oyus kennicottii*					Yes
Western Scrub Jay	*Aphelocoma californica*					Yes
Western Tanager	*Piranga ludoviciana*					Yes
Western Wood-peewee	*Contopus sordidulus*					Yes
White-breasted Nuthatch	*Sitta carolinensis*					Yes
White-crowned Sparrow	*Zonotrichia leucophrys*					Yes
White-headed Woodpecker	*Picoides albolarvatus*	BSO	SoC	SC	4	Yes
Wild Turkey	*Meleagris gallopavo*					Yes
Willet	*Catoptrophorus semipalmatus*					Yes
Williamson's Sapsucker	*Sphyrapicus thyroideus*	BTO		SU	4	Yes
Willow Flycatcher	*Empidonax traillii*	BT	SoC	SU	4	Yes
Wilson's Warbler	*Wilsonia pusilla*					Yes
Wood Duck	*Aix sponsa*					Yes
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*					Yes
Yellow-rumped Warbler	*Dendroica coronata*					Yes
Yellow Warbler	*Dendroica petechia*					Yes
Amphibians						
Long-toed Salamander	*Ambystoma macrodactylum*					Likely present
Western Toad	*Bufo boreas*	BT		SV	4	Likely present
Pacific Tree Frog	*Pseudacris regilla*					Yes
Bullfrog	*Rana catesbeiana*					Yes
Reptiles						
Northwestern Pond Turtle	*Clemmys marmorata marmorata*	BSO	SoC	SC	1	Yes
Short-horned Lizard	*Phrynosoma douglassii*					Likely present
Northern Sagebrush Lizard	*Sceloporus graciosus graciosus*	BTO	SoC	SV	4	Yes
Western Fence Lizard	*Sceloporus occidentalis*					Yes
Western Skink	*Eumeces skiltonianus*					Yes
Rubber Boa	*Charina bottae*					Yes
Yellow-bellied Racer	*Coluber constrictor*					Yes
Gopher Snake	*Pituophis melanoleucus*					Yes
W. Terrestrial Garter Snake	*Thamnophis elegans*					Yes
Common Garter Snake	*Thamnophis sirtalis*					Yes
Western Rattlesnake	*Crotalus viridis*					Yes

Definitions

BUREAU STATUS (BLM)

BS = Bureau Sensitive in Oregon and Washington (BSO = in Oregon, BSW = in Washington)
According to the definition in the Bureau 6840 policy, BS designation includes species that could easily become endangered or extinct in a state. They are restricted in range and have natural or human-caused threats to

survival. BS species are not FE, FT, FPE, FPT, FC, SE, or ST, but are eligible for federal or state listing or candidate status. BS species are designated by the State Director and are tiered to the state fish/wildlife/botanical agencies' or ONHP designations. BS species that are Oregon state Critical - animals and Candidates - plants, Washington state Sensitive - animals and Threatened and Endangered - plants, or ONHP List 1 are considered BS species. (See Table 1 below)

Bureau 6840 policy requires that any Bureau action will not contribute to the need to list any of these species (i.e., equivalent to 6840 policy applied to federal candidate).
For OR/WA BLM, per IM 2000-022 of 12/28/99, any federally de-listed as endangered or threatened species is designated as BS for at least the 5 year monitoring period required by the ESA. These species may also have another status as ST or SE; it is the only case where these statuses are not mutually exclusive.

BA = Bureau Assessment in Oregon and Washington (BAO = in Oregon, BAW = in Washington)
Bureau Assessment is a category that pertains to OR/WA BLM only per the OR/WA BLM 6840 policy. Plant and wildlife species which are not presently eligible for official federal or state status but are of concern in Oregon or Washington may, at a minimum, need protection or mitigation in BLM activities. These species will be considered as a level of special status species separate from BS, and are referred to as BA species.

Clearances for BA species will be done subject to limitations in funding and/or positions. Impacts will be determined and recommendations for the species will be considered on a case by case basis through NEPA process and in balance with other resource considerations. Where possible, measures should be taken in project planning to protect the species.

Per BLM OR/WA 6840 policy, only vertebrate animals and plants are given BA status. Therefore invertebrates and fungi are not BA; they may be BS per Bureau 6840 policy or BT per BLM OR/WA 6840 policy.

BT=Bureau Tracking in both Oregon and Washington (BTO = in Oregon, BTW = in Washington)
Bureau Tracking is a status that portions to OR/WA BLM only per the BLM OR/WA 6840 policy. To enable an early warning for species which may become of concern in the future, districts are encouraged to collect occurrence data on species for which more information is needed to determine status within the state or which no longer need active management. Until status of such species changes to federal or state listed or proposed, FC, BS or BA species, BT will not be considered as special status species for management purposes.

Information based on BLM IM OR 91-57, Oregon-Washington Special Status Species 6840 Policy, November 5, 1990 and the agency Bureau 6840 policy of 9/16/88.

FEDERAL STATUS

LE = Listed Endangered
Taxa listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) as Endangered under the Endangered Species Act (ESA), or by the Departments of Agriculture (ODA) and Fish and Wildlife (ODFW) of the state of Oregon under the Oregon Endangered Species Act of 1987 (OESA).

LT = Listed Threatened
Taxa listed by the USFWS, NMFS, ODA, or ODFW as Threatened.

PE = Proposed Endangered
Taxa proposed by the USFWS or NMFS to be listed as Endangered under the ESA or by ODFW or ODA under the OESA.

PT = Proposed Threatened
Taxa proposed by the USFWS or NMFS to be listed as Threatened under the ESA or by ODFW or ODA under the OESA.

C = Candidate

Taxa for which NMFS or USFWS have sufficient information to support a proposal to list under the ESA, or which is a candidate for listing by the ODA under the OESA.

SoC = Species of Concern
Former C2 candidates which need additional information in order to propose as Threatened or Endangered under the ESA. These are species which USFWS is reviewing for consideration as Candidates for listing under the ESA.

Endangered taxa are those which are in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range.

Threatened taxa are those likely to become endangered within the foreseeable future.

STATE STATUS

Oregon's Threatened and Endangered Species Program – ODFW

Martin Nugent, Wildlife Diversity Program Manager The Oregon Department of Fish and Wildlife (ODFW) maintains a list of threatened and endangered species under the authority of ORS 496.172, the Oregon Endangered Species Act, 1987. The list included in this booklet reflects ODFW's revisions as of December 2000. There are currently 36 taxa on the list. The list includes 12 marine animals (i.e. whales, sea turtles) that are not included in this book. The Act requires state agencies to develop programs for the management and protection of endangered species, and requires agencies to comply with guidelines adopted by the Oregon Fish and Wildlife Commission for threatened species. The Oregon Fish and Wildlife Commission has adopted administrative rules, OAR 635-100-100 to 130, which clarify the Act and provide criteria for listing, delisting and protection of listed species.

The Oregon Fish and Wildlife Commission has also adopted a rule requiring the department to develop and maintain a state list of Sensitive Species for vertebrates in the state. The rule is OAR 635-100-040. Sensitive species constitute naturally-reproducing native vertebrates which are likely to become threatened or endangered throughout all or a significant portion of their range in Oregon. The Sensitive Species list is for the express purpose of encouraging actions that will prevent further decline in species' populations and/or habitats and thus avoiding the need for listing. This list is updated biennially. The list used here is from December 1997. Anyone may request that a species be added to or removed from the list by writing to the department and providing justification for the requested action. Sensitive species are broken into four categories defined as follows:

SC = State Critical - Species for which listing as threatened or endangered is pending; or those for which listing as threatened or endangered may be appropriate if immediate conservation actions are not taken. Also considered critical are some peripheral species which are at risk throughout their range, and some disjunct populations.

SV = State Vulnerable - Species for which listing as threatened or endangered is not believed to be imminent and can be avoided through continued or expanded use of adequate protective measures and monitoring. In some cases the population is sustainable, and protective measures are being implemented; in others, the population may be declining and improved protective measures are needed to maintain sustainable populations over time.

SP = Peripheral or Naturally Rare - Peripheral species refer to those whose Oregon populations are on the edge of their range. Naturally rare species are those which had low population numbers historically in Oregon because of naturally limiting factors. Maintaining the status quo for the habitats and populations of these species is a minimum requirement. Disjunct populations of several species which occur in Oregon should not be confused with peripheral.

SU = Status Undetermined - Animals in this category are species for which status is unclear. They may be susceptible to population decline of sufficient magnitude that they could qualify for endangered, threatened, critical or vulnerable status, but scientific study will be required before a judgment can be made.

Heritage Program Lists (ORNHP). The criteria for the Heritage Program lists are as follows:

<u>List 1</u> - Contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range.

<u>List 2</u> - Contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. ORNHP regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list.

<u>List 3</u> - Contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.

<u>List 4</u> - Contains taxa which are of conservation concern but are not currently threatened or endangered. This includes taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. While these taxa currently may not need the same active management attention as threatened or endangered taxa, they do require continued monitoring.

APPENDIX B- CULTURAL RESOURCES SITE LIST

Cultural Resources Located Within the Gerber/Willow Valley Watershed Analysis Area

BLM Field Number (FY-)	Permanent Trinomial	Cultural Period	Site Type
02-014-022	35KL -	Prehistoric	Lithic Scatter
02-014-035	35KL -	Multi-Component	Can Dump/Lithic Scatter
02-014-036	35KL -	Multi-Component	Can Dump/Lithics
02-014-037	35KL -	Historic	Rock Wall
02-014-038	35KL -	Prehistoric	Rock Ring
02-014-039	35KL -	Prehistoric	Lithic Scatter
02-014-040	35KL -	Prehistoric	Rock Ring
02-014-043	35KL -	Prehistoric	Lithic Scatter
02-014-044	35KL -	Prehistoric	Lithic Scatter
02-014-046	35KL -	Prehistoric	Rock Cairn
02-014-047	35KL -	Historic	Can Dump
02-014-048	35KL -	Historic	Can Dump
02-014-049	35KL -	Historic	Can Dump
02-014-050	35KL -	Historic	Can Dump
02-014-051	35KL -	Historic	Can Dump
02-014-052	35KL -	Prehistoric	Rock Cairn
02-014-053	35KL -	Prehistoric	Rock Cairns
02-014-054	35KL -	Historic	Rock Cairn
02-014-055	35KL -	Prehistoric	Rock Cairns
02-014-056	35KL -	Prehistoric	Lithic Scatter
02-014-057	35KL -	Prehistoric	Lithic Scatter
02-014-058	35KL -	Prehistoric	Lithic Scatter
02-014-059	35KL -	Prehistoric	Lithic Scatter
02-014-060	35KL -	Prehistoric	Rock Ring
02-014-061	35KL -	Prehistoric	Rock Cairns
02-014-062	35KL -	Prehistoric	Rock Cairns/Lithic Scatter
02-014-063	35KL -	Prehistoric	Rock Cairns
02-014-064	35KL -	Prehistoric	Rock Ring
02-014-065	35KL -	Prehistoric	Rock Features
02-014-066	35KL -	Prehistoric	Lithic Scatter
02-014-067	35KL -	Prehistoric	Rock Cairns
02-014-068	35KL -	Historic	Cadastral Marker
02-014-069	35KL -	Prehistoric	Rock Cairns
02-014-070	35KL -	Historic	Cadastral Marker
02-014-071	35KL -	Prehistoric	Rock Cairn
02-014-072	35KL -	Historic	Cadastral Marker
02-014-073	35KL -	Historic	Cadastral Marker
02-014-074	35KL -	Prehistoric	Rock Cairns
02-014-075	35KL -	Historic	Cadastral Marker
02-014-076	35KL -	Historic	Cadastral Marker
02-014-077	35KL -	Historic	Cadastral Marker
02-014-078	35KL -	Historic	Cadastral Marker
02-014-079	35KL -	Historic	Cadastral Marker
02-014-080	35KL -	Prehistoric	Rock Cairns
02-014-081	35KL -	Prehistoric	Lithic Scatter
02-014-082	35KL -	Historic	Can Dump
02-014-083	35KL -	Prehistoric	Rock Cairns
02-014-084	35KL -	Prehistoric	Rock Cairn
02-014-085	35KL -	Prehistoric	Rock Cairns/Lithic Scatter

02-014-086	35KL -	Prehistoric	Rock Cairn
02-014-087	35KL -	Prehistoric	Rock Cairns/Lithic Scatters
02-014-092	35KL -	Prehistoric	Rock Cairns
02-014-093	35KL -	Prehistoric	Rock Cairns
02-014-094	35KL -	Prehistoric	Rock Cairns/Lithic Scatter
02-014-095	35KL -	Prehistoric	Rock Cairns/Lithic Scatter
02-014-096	35KL -	Prehistoric	Rock Cairns
02-014-097	35KL -	Historic	Can Dump
02-014-098	35KL -	Prehistoric	Rock Cairns
02-014-099	35KL -	Prehistoric	Lithic Scatter
02-014-100	35KL -	Historic	Can Dump
02-014-101	35KL -	Prehistoric	Lithic Scatter
02-014-102	35KL -	Prehistoric	Lithic Scatter
02-014-103	35KL -	Prehistoric	Lithic Scatter
02-014-104	35KL -	Prehistoric	Rock Cairns
02-014-105	35KL -	Prehistoric	Rock Cairns
02-014-106	35KL -	Prehistoric	Rock Cairns/Lithic Scatter
02-014-107	35KL -	Prehistoric	Lithic Scatter
02-014-108	35KL -	Prehistoric	Rock Cairns
02-014-110	35KL -	Prehistoric	Rock Cairns
02-014-111	35KL -	Prehistoric	Rock Cairns
02-014-112	35KL -	Prehistoric	Lithic Scatter
02-014-113	35KL -	Historic	Can Dump
02-014-114	35KL -	Prehistoric	Lithic Scatter
02-014-115	35KL -	Prehistoric	Rock Cairns
02-014-116	35KL -	Prehistoric	Rock Features
02-014-117	35KL -	Historic	Can Dump
02-014-120	35KL -	Prehistoric	Lithic Scatter
02-014-121	35KL -	Prehistoric	Rock Cairns/Lithic Scatter
02-014-123	35KL -	Prehistoric	Lithic Scatter
02-014-124	35KL -	Prehistoric	Lithic Scatter
02-014-151	35KL -	Historic	Cadastral Marker
02-014-152	35KL -	Historic	Can Dump
02-014-154	35KL -	Historic	Can Dump
02-014-155	35KL -	Historic	Can Dump
02-014-156	35KL -	Historic	Can Dump
02-014-157	35KL -	Historic	Can Dump
02-014-158	35KL -	Prehistoric	Lithic Scatter
02-014-159	35KL -	Historic	Can Dump
02-014-160	35KL -	Prehistoric	Lithic Scatter
02-014-161	35KL -	Historic	Can Dump
02-014-162	35KL -	Historic	Cadastral Marker
02-014-164	35KL -	Prehistoric	Lithic Scatter
02-014-165	35KL -	Prehistoric	Lithic Scatter
02-014-166	35KL -	Prehistoric	Lithic Scatter
02-014-168	35KL -	Prehistoric	Lithic Scatter
02-014-169	35KL -	Prehistoric	Lithic Scatter
02-014-170	35KL -	Prehistoric	Rock Ring/Lithic Scatter
02-014-171	35KL -	Prehistoric	Rock Cairns
02-014-172	35KL -	Prehistoric	Rock Cairns
02-014-173	35KL -	Prehistoric	Rock Cairns
02-014-174	35KL -	Prehistoric	Rock Cairns
02-014-175	35KL -	Prehistoric	Rock Ring/Lithic Scatter
02-014-176	35KL -	Prehistoric	Rock Cairns
02-014-177	35KL -	Prehistoric	Rock Cairns
02-014-178	35KL -	Prehistoric	Lithic Scatter
02-014-179	35KL -	Multi-Component	Lithic Scatter/Can Dump

02-014-180	35KL -	Prehistoric	Can Dump
02-014-181	35KL -	Prehistoric	Can Dump
02-014-182	35KL -	Prehistoric	Can Dump
02-014-183	35KL -	Prehistoric	Can Dump
02-014-184	35KL -	Prehistoric	Can Dump
02-014-185	35KL -	Multi-Component	Lithic Scatter/Can Dump
02-014-186	35KL -	Prehistoric	Lithic Scatter
02-014-187	35KL -	Historic	Can Dump
02-014-188	35KL -	Prehistoric	Lithic Scatter
02-014-189	35KL -	Prehistoric	Lithic Scatter
02-014-190	35KL -	Prehistoric	Lithic Scatter
02-014-191	35KL -	Prehistoric	Lithic Scatter
02-014-192	35KL -	Prehistoric	Lithic Scatter
02-014-193	35KL -	Prehistoric	Lithic Scatter
02-014-194	35KL -	Prehistoric	Lithic Scatter
02-014-195	35KL -	Prehistoric	Lithic Scatter
01-014-006	Part of 35KL75	Multi-Component	Rock Rings/Can Dump
01-014-008	35KL2322	Prehistoric	Rock Features/Lithic Scatter
01-014-029	35KL2323	Multi-Component	Lithic Scatter/Can Dump
01-014-041	35KL2232	Prehistoric	Lithic Scatter
01-014-042	35KL2230	Prehistoric	Rock Ring
01-014-043	35KL2231	Prehistoric	Lithic Scatter
01-014-044	35KL2233	Prehistoric	Rock Ring/Lithic Scatter
01-014-045	35KL2234	Prehistoric	Lithic Scatter
01-014-046	35KL2235	Prehistoric	Lithic Scatter
01-014-047	35KL2236	Prehistoric	Lithic Scatter
01-014-048	35KL2237	Prehistoric	Lithic Scatter
01-014-049	35KL2238	Prehistoric	Rock Allignment
01-014-050	35KL2239	Prehistoric	Lithic Scatter
01-014-051	35KL2240	Prehistoric	Lithic Scatter
01-014-052	35KL2241	Prehistoric	Lithic Scatter
01-014-053	35KL224	Prehistoric	Rock Rings
01-014-054	35KL2242	Prehistoric	Lithic Scatter
01-014-055	35KL2243	Prehistoric	Lithic Scatter
01-014-056	35KL2244	Prehistoric	Lithic Scatter
01-014-057	35KL -	Prehistoric	Lithic Scatter
01-014-058	35KL -	Prehistoric	Lithic Scatter
01-014-059	35KL -	Prehistoric	Lithic Scatter
01-014-060	35KL -	Prehistoric	Rock Cairns/Alignments
01-014-120	35KL -	Inadequate Info	Inadequate Information
01-014-121	35KL2245	Prehistoric	Lithic Scatter
01-014-122	35KL2246	Prehistoric	Lithic Scatter
01-014-123	35KL2247	Prehistoric	Bedrock Mortars/Lithic Scatter
01-014-124	35KL2248	Historic	Can Dump
01-014-125	35KL2249	Prehistoric	Lithic Scatter
01-014-126	35KL2250	Prehistoric	Petroglyphs
01-014-127	35KL2251	Prehistoric	Rock Cairns
01-014-128	35KL2252	Prehistoric	Rock Ring/Lithic Scatter
00-014-002	35KL2161	Prehistoric	Lithic Scatter
00-014-003	35KL -	Historic	Rock Feature
00-014-004	35KL -	Prehistoric	Petroglyphs
00-014-005	35KL -	Multi-Component	Rock Ring/Shack
00-014-006	Part of 35KL75	Prehistoric	Village
00-014-014	ORKL119	Prehistoric	Rock Cairns
00-014-015	35KL2162	Multi-Component	Can Dump/Lithic Scatter
00-014-016	35KL2163	Prehistoric	Lithic Scatter
00-014-017	35KL2164	Prehistoric	Lithic Scatter

00-014-026	35KL2165	Prehistoric	Lithic Scatter
00-014-027	35KL2166	Multi-Component	Lithic Scatter/Metal Debris
00-014-028	35KL2167	Prehistoric	Lithic Scatter
00-014-029	35KL2168	Prehistoric	Lithic Scatter
00-014-035	ORKL121	Historic	Can Dump
00-014-036	35KL2169	Prehistoric	Lithic Scatter
00-014-037	ORKL120	Historic	Can Dump
00-014-038	35KL2170	Prehistoric	Lithic Scatter
00-014-039	35KL2171	Prehistoric	Litrhic Scatter
00-014-040	35KL2172	Prehistoric	Lithic Scatter
00-014-056	ORKL115	Historic	Refuse Scatter
00-014-101	35KL2183	Prehistoric	Lithic Scatter
00-014-107	35KL2184	Prehistoric	Lithic Scatter
00-014-108	ORKL123	Historic	Can Dump
00-014-109	35KL2185	Prehistoric	Lithic Scatter
00-014-110	ORKL124	Historic	Can Dump
00-014-112	35KL2187	Prehistoric	Lithic Scatter
00-014-113	ORKL118	Prehistoric	Rock Cairns
00-014-113	35KL2188	Prehistoric	Lithic Scatter
00-014-114	35KL2189	Prehistoric	Lithic Scatter
00-014-115	35KL2190	Multi-Component	Can Dump/Lithic Scatter
00-014-116	35KL2163	Prehistoric	Lithic Scatter
00-014-117	35KL2164	Prehistoric	Lithic Scatter
00-014-118	ORKL116	Historic	Can Dump
00-014-119	35KL -	Prehistoric	Peeled Tree
00-014-120	35KL2193	Prehistoric	Lithic Scatter
00-014-121	35KL2194	Prehistoric	Lithic Scatter
00-014-123	35KL -	Prehistoric	Vision Quest
00-014-125	35KL2197	Historic	Can Dump
00-014-126	35KL2198	Prehistoric	Lithic Scatter
00-014-127	35KL2199	Prehistoric	Lithic Scatter
00-014-128	35KL2200	Prehistoric	Peeled Tree
00-014-129	35KL -	Prehistoric	Peeled Tree
00-014-130	35KL2201	Prehistoric	Lithic Scatter
00-014-131	ORKL126	Historic	Can Dump
00-014-132	35KL2202	Prehistoric	Lithic Scatter
00-014-133	35KL2203	Prehistoric	Lithic Scatter
00-014-134	35KL2204	Prehistoric	Lithic Scatter
00-014-135	35KL2205	Prehistoric	Lithic Scatter
00-014-136	35KL2206	Prehistoric	Lithic Scatter
00-014-137	35KL2207	Prehistoric	Lithic Scatter
00-014-138	35KL2208	Prehistoric	Lithic Scatter
00-014-139	35KL2209	Prehistoric	Rock Cairns
00-014-140	35KL2210	Prehistoric	Lithic Scatter
00-014-141	35KL2211	Prehistoric	Lithic Scatter
00-014-142	35KL2212	Prehistoric	Lithic Scatter
00-014-143	35KL2213	Prehistoric	Lithic Scatter
00-014-144	35KL2214	Prehistoric	Lithic Scatter
00-014-145	35KL2215	Prehistoric	Lithic Scatter
00-014-146	35KL2216	Prehistoric	Lithic Scatter
00-014-147	35KL2217	Prehistoric	Lithic Scatter
99-014-003	35KL2086	Prehistoric	Rock Cairns
99-014-015	35KL2087	Prehistoric	Rock Cairns
99-014-016	35KL2106	Prehistoric	Lithic Scatter
99-014-017	35KL -	Prehistoric	Rock Cairns
99-014-018	35KL2100	Prehistoric	Lithic Scatter
99-014-019	35KL2101	Prehistoric	Lithic Scatter

99-014-020	35KL -	Historic	Can Dump
99-014-025	35KL2102	Multi-Component	Lithic Scatter/Can Dump
99-014-026	35KL2103	Prehistoric	Lithic Scatter
99-014-027	35KL2104	Prehistoric	Lithic Scatter
99-014-028	35KL2105	Prehistoric	Lithic Scatter
99-014-064	35KL2109	Prehistoric	Lithic Scatter
99-014-065	Not Reported/ Private	Prehistoric	Lithic Scatter
99-014-074	35KL2135	Prehistoric	Lithic Scatter
99-014-075	35KL2136	Prehistoric	Lithic Scatter
99-014-076	35KL2137	Prehistoric	Lithic Scatter
99-014-078	35KL2138	Prehistoric	Lithic Scatter
98-014-005	35KL -	Historic	Can Dump
98-014-006	35KL -	Historic	Can Dump
98-014-007	35KL -	Historic	Can Dump
98-014-008	35KL2006	Prehistoric	Lithic Scatter
98-014-009	35KL2007	Prehistoric	Lithic Scatter
98-014-010	35KL2012	Multi-Component	Lithic Scatter/Can Dump
98-014-011	35KL2013	Prehistoric	Lithic Scatter
98-014-012	35KL2014	Prehistoric	Lithic Scatter
98-014-013	35KL2015	Prehistoric	Lithic Scatter
98-014-014	35KL2016	Prehistoric	Lithic Scatter
98-014-016	35KL2008	Prehistoric	Lithic Scatter
98-014-017	35KL2009	Prehistoric	Lithic Scatter
98-014-050	35KL2010	Prehistoric	Lithic Scatter
98-014-051	35KL2011	Prehistoric	Lithic Scatter
98-014-052	ORKL107	Historic	Can Dump
98-014-053	35KL2058	Prehistoric	Lithic Scatter
98-014-054	35KL2059	Prehistoric	Lithic Scatter
98-014-055	35KL2060	Prehistoric	Lithic Scatter
98-014-056	35KL2161	Prehistoric	Lithic Scatter
98-014-057	35KL2062	Prehistoric	Lithic Scatter
98-014-058	35KL2063	Prehistoric	Lithic Scatter
98-014-059	35KL2064	Prehistoric	Lithic Scatter
98-014-060	35KL2065	Prehistoric	Rock Cairns/Lithic Scatter
98-014-061	35KL2066	Prehistoric	Rock Cairns/Lithic Scatter
98-014-062	35KL2047	Prehistoric	Village/Vision Quest
98-014-063	35KL2048	Prehistoric	Village/Vision Quest
98-014-064	35KL2049	Prehistoric	Hunting Blind/Bedrock Mortars
98-014-065	35KL2050	Prehistoric	Village Site
98-014-066	35KL2051	Prehistoric	Village Site
98-014-067	35KL -	Prehistoric	Peeled Tree
98-014-068	35KL2052	Prehistoric	Lithic Scatter
98-014-070	35KL2053	Prehistoric	Lithic Scatter
98-014-071	35KL -	Prehistoric	Rock Cairns
98-014-072	35KL2054	Prehistoric	Lithic Scatter
98-014-073	35KL2055	Prehistoric	Village
98-014-074	35KL2056	Prehistoric	Hunting Blinds
98-014-075	35KL2057	Prehistoric	Village
98-014-076	35KL2067	Prehistoric	Lithic Scatter
98-014-084	35KL2069	Prehistoric	Lithic Scatter
98-014-089	35KL2068	Prehistoric	Lithic Scatter/House pits
97-014-001	35KL1945	Prehistoric	Lithic Scatter
97-014-002	35KL1946	Prehistoric	Lithic Scatter
97-014-003	35KL1947	Prehistoric	Lithic Scatter
97-014-004	35KL1957	Historic	Fence Line
97-014-036	35KL -	Inadequate Info	Inadequate Information

97-014-042	35KL1948	Prehistoric	Rock Cairns/Groundstone
97-014-052	35KL1972	Prehistoric	Lithic Scatter
97-014-053	35KL1973	Prehistoric	Lithic Scatter
97-014-055	35KL1959	Prehistoric	Lithic Scatter
97-014-056	35KL1960	Prehistoric	Lithic Scatter
97-014-079	35KL -	Prehistoric	Lithic Scatter
96-014-001	35KL -	Prehistoric	Lithic Scatter
96-014-002	35KL1893	Prehistoric	Lithic Scatter
96-014-003	35KL -	Historic	Can Dump
96-014-005	35KL -	Historic	Corrals
96-014-015	35KL -	Prehistoric	Rock Cairns
96-014-017	35KL1895	Prehistoric	Hunting Blinds
96-014-018	35KL1896	Prehistoric	Vision Quest/Lithic Scatter
96-014-019	35KL -	Prehistoric	Lithic Scatter
96-014-020	35KL1897	Prehistoric	Prehistoric Village
96-014-021	35KL1898	Prehistoric	Lithic Scatter
96-014-022	35KL -	Prehistoric	Rock Shelter
96-014-023	35KL1899	Prehistoric	Lithic Scatter
96-014-025	35KL -	Prehistoric	Sparse Lithic Scatter
96-014-033	35KL1902	Prehistoric	Lithic Scatter
96-014-034	35KL1903	Prehistoric	Lithic Scatter
96-014-035	35KL1904	Multi-Component	Lithic Scatter/Insulator
96-014-036	35KL1905	Prehistoric	Lithic Scatter
96-014-037	35KL1906	Prehistoric	Rock hunting Blind
96-014-038	35KL1907	Prehistoric	Rock Cairns
96-014-039	35KL1908	Prehistoric	Lithic Scatter
96-014-040	35KL1909	Prehistoric	Rock Cairns
96-014-041	35KL1910	Prehistoric	Lithic Scatter
96-014-042	35KL1911	Prehistoric	Lithic Scatter
96-014-043	35KL1912	Prehistoric	Lithic Scatter
96-014-044	35KL1913	Prehistoric	Vision Quest
96-014-045	35KL1914	Prehistoric	Lithic Scatter
96-014-8A	35KL -	Multi-Component	Vision Quest/Lithic Scatter/CCC
		Fence/Wagon Trail?	
95-014-002/76-014-007	35KL68	Prehistoric	Lithic Scatter
95-014-010	35KL -	Prehistoric	Lithic Scatter
95-014-011	35KL -	Prehistoric	Cadastral Marker
95-014-012	35KL1794	Prehistoric	Cadastral Marker
95-014-013	35KL1795	Prehistoric	Lithic Scatter
95-014-014	35KL1796	Prehistoric	Rock Cairns
95-014-016	35KL1797	Prehistoric	Rock Cairns
95-014-017	35KL1798	Prehistoric	Rock Cairns/Bedrock Mortars
95-014-018	35KL1799	Prehistoric	Rock Cairns/Lithic Scatter
95-014-019	35KL1800	Prehistoric	Rock Cairns
95-014-020	35KL1801	Prehistoric	Rock Cairns/Lithic Scatter
95-014-021	35KL1802	Prehistoric	Lithic Scatter
95-014-023	35KL1803	Prehistoric	Lithic Scatter
95-014-024	35KL1804	Prehistoric	Rock Cairns/Hunting Blinds
95-014-025	35KL1805	Prehistoric	Lithic Scatter
95-014-026	35KL1806	Prehistoric	Lithic Scatter
94-014-064	35KL -	Prehistoric	Lithic Scatter
94-014-065	35KL -	Prehistoric	Lithic Scatter
94-014-066	35KL -	Prehistoric	Lithic Scatter
94-014-068	35KL -	Prehistoric	Lithic Scatter
94-014-069	35KL -	Prehistoric	Lithic Scatter/Rock Cairns
94-014-071	35KL -	Prehistoric	Vision Quest
94-014-072	35KL -	Prehistoric	Vision Quest

94-014-073	35KL -	Prehistoric	Petroglyphs
94-014-074	35KL -	Prehistoric	Lithic Scatter
94-014-075	35KL -	Prehistoric	Lithic Scatter
94-014-076	35KL -	Prehistoric	Vision Quest
94-014-077	35KL -	Prehistoric	Vision Quest
94-014-078	35KL -	Prehistoric	Lithic Scatter
94-014-079	35KL -	Prehistoric	Vision Quest
94-014-081	35KL1929	Prehistoric	Lithic Scatter
94-014-083	35KL -	Prehistoric	Vision Quest
94-014-084	35KL -	Prehistoric	Lithic Scatter
94-014-085	35KL -	Prehistoric	Lithic Scatter
94-014-086	35KL -	Prehistoric	Lithic Scatter
94-014-087	35KL -	Prehistoric	Lithic Scatter
94-014-088	35KL -	Prehistoric	Lithic Scatter
94-014-089	35KL -	Historic	Rock Fence
94-014-091	35KL -	Prehistoric	Lithic Scatter
94-014-094	35KL -	Prehistoric	Lithic Scatter
94-014-095	35KL -	Prehistoric	Lithic Scatter
94-014-096	35KL -	Prehistoric	Lithic Scatter
94-014-097	35KL -	Prehistoric	Vision Quest
94-014-098	35KL -	Prehistoric	Lithic Scatter
94-014-099	35KL -	Prehistoric	Lithic Scatter
94-014-100	35KL -	Prehistoric	Vision Quest/Lithic Scatter
94-014-101	35KL -	Prehistoric	Lithic Scatter
94-014-102	35KL -	Prehistoric	Vision Quest
94-014-103	35KL -	Prehistoric	Lithic Scatter
94-014-104	35KL -	Prehistoric	Hunting Blind
94-014-105	35KL -	Historic	Rock Fence
94-014-112	35KL -	Prehistoric	Vision Quest
94-014-114	35KL -	Multi-Component	Vision Quest/Lithic Scatter/Fence
94-014-115	35KL -	Prehistoric	Vision Quest
94-014-116	35KL -	Prehistoric	Lithic Scatter
94-014-117	35KL -	Historic	Figure-4 Fence
91-014-001	35KL933	Prehistoric	Rock Ring/WWII Debitage
FY91-014-003 (39/14-9-1)	35KL988	Prehistoric	Lithic Scatter
91-014-007	35KL982	Prehistoric	Lithic Scatter/Rock Features
91-014-008	35KL983	Prehistoric	Lithic Scatter
90-014-001	35KL889	Prehistoric	Lithic Scatter
90-014-002	35KL890	Prehistoric	Lithic Scatter
90-014-003 (H38/13-26-1)	35KL891	Historic	Homestead
90-014-005	35KL -	Prehistoric	Prehistoric Village
90-014-009	35KL -	Prehistoric	Lithic Scatter
88-014-001	35KL700	Prehistoric	Village
88-014-002	35KL701	Prehistoric	Village
88-014-003	35KL704	Prehistoric	Village
88-014-004	35KL706	Prehistoric	Village
88-014-005	35KL709	Prehistoric	Village
88-014-006	35KL711	Prehistoric	Village
88-014-007	35KL712	Prehistoric	Village
88-014-008	35KL713	Prehistoric	Village
88-014-009	ORKL002	Historic	Ranch
87-014-002 (LR-22)	35KL -	Prehistoric	Lithic Scatter
87-014-003 (LR-53)	35KL110	Prehistoric	Lithic Scatter
87-014-006 (LR-79)	35KL -	Prehistoric	Lithic Scatter/Possible Rock Ring
87-014-012 (LR-100)	35KL2254	Prehistoric	Rock Rings

87-014-013 (LR-107)	35KL -	Prehistoric	Lithic Scatter
87-014-014 (LR-111)	35KL -	Prehistoric	Lithic Scatter
87-014-015 (LR-113)	35KL -	Prehistoric	Lithic Scatter
87-014-017 (LR-118)	35KL2255	Prehistoric	Rock Rings
87-014-020 (LR-136)	35KL -	Prehistoric	Lithic Scatter
87-014-021 (LR 142)	35KL -	Prehistoric	Lithic Scatter
87-014-022 (LR-143)	35KL -	Prehistoric	Lithic Scatter
87-014-023 (LR-144)	35KL -	Prehistoric	Lithic Scatter
87-014-024 (LR-152)	35KL2256	Prehistoric	Rock Ring/Lithic Scatter
87-014-025 (LR-156)	35KL -	Prehistoric	Lithic Scatter
87-014-026 (LR-170)	35KL -	Prehistoric	Rock Rings
87-014-027 (LR-188)	35KL -	Prehistoric	Lithic Scatter
87-014-028 (LR-190)	35KL -	Prehistoric	Rock Rings
87-014-032 (LR-132)	35KL -	Inadequate Info	Inadequate Information
87-014-033 (LR-27)	35KL -	Inadequate Info	Inadequate Information
87-014-034 (LR-210)	35KL -	Prehistoric	Lithic Scatter
87-014-035 (LR-92)	35KL -	Inadequate Info	Inadequate Information
86-014-001 (B-2)	35KL -	Prehistoric	Lithic Scatter
86-014-002 (B-3/4)	35KL -	Prehistoric	Lithic Scatter
86-014-004 (B-15)	35KL -	Prehistoric	Lithic Scatter
86-014-005 (B-16)	35KL -	Prehistoric	Lithic Scatter
86-014-007 (B-27)	35KL -	Prehistoric	Lithic Scatter
86-014-009 (W-99)	35KL -	Prehistoric	Lithic Scatter
86-014-010 (W-81)	35KL -	Prehistoric	Lithic Scatter
86-014-011 (W-80/82/83/86/87/88/92)	35KL -	Multi-Component	Historic Feature/Lithic Scatter
86-014-012 (W-79)	35KL -	Prehistoric	Lithic Scatter
86-014-013 (W-62)	35KL -	Prehistoric	Lithic Scatter
86-014-014 (W-6)	35KL -	Prehistoric	Lithic Scatter
86-014-015 (W-53)	35KL -	Prehistoric	Lithic Scatter
86-014-016 (W-5)	35KL -	Prehistoric	Lithic Scatter
86-014-017 (W-46)	35KL -	Prehistoric	Rock Cairns
86-014-018 (W-4)	35KL -	Prehistoric	Lithic Scatter
86-014-019 (W-12)	35KL -	Prehistoric	Lithic Scatter
86-014-020 (W-10)	35KL -	Prehistoric	Lithic Scatter
81-014-001	35KL67	Prehistoric	Lithic Scatter
81-014-002	35KL69	Prehistoric	Lithic Scatter
81-014-003	35KL219	Prehistoric	Lithic Scatter
81-014-006	35KL223	Prehistoric	Lithic Scatter
81-014-007	35KL224	Prehistoric	Rock Rings
81-014-008	35KL225	Prehistoric	Lithic Scatter
81-014-009	35KL226	Multi-Component	Homestead/Lithic Scatter
81-014-010	35KL227	Prehistoric	Lithic Scatter
81-014-011	35KL228	Prehistoric	Rock Ring
81-014-012	35KL229	Prehistoric	Village
81-014-013	35KL699	Prehistoric	Lithic Scatter
81-014-014	35KL702	Prehistoric	Village
81-014-015	35KL703	Prehistoric	Village
81-014-016	35KL705	Prehistoric	Village
81-014-017	35KL707	Prehistoric	Village
81-014-018	35KL708	Prehistoric	Village
81-014-019	35KL710	Prehistoric	Lithic Scatter
81-014-020/ 81-010-KL14	35KL702	Prehistoric	House Rings/Lithic Scatter
81-014-021/ 81-010-KL16	35KL705	Prehistoric	House Rings/Lithic Scatter
80-014-001	35KL220	Prehistoric	Village

80-014-002	35KL221	Prehistoric	Village
80-014-006	35KL83/222	Prehistoric	Village
77-014-001	35KL47	Prehistoric	Rockshelter/Petroglyphs
77-014-002	35KL48	Prehistoric	Petroglyphs
77-014-003	35KL49	Prehistoric	Rock Rings
77-014-004	35KL50	Prehistoric	Village
77-014-005	35KL51	Prehistoric	Rock Ring
77-014-006	35KL53	Prehistoric	Lithic Scatter
77-014-007	35KL54	Prehistoric	Lithic Scatter
77-014-008	35KL55	Prehistoric	Rock Rings
77-014-009	35KL56	Prehistoric	Rock Ring
77-014-010	35KL57	Prehistoric	Lithic Scatter
77-014-011	35KL58	Prehistoric	Petroglyphs
77-014-012	35KL73	Prehistoric	Stone Rings
77-014-014	35KL75	Prehistoric	Village
77-014-015	35KL76	Prehistoric	Rock Rings
77-014-016	35KL77	Prehistoric	Rock Rings
77-014-017	35KL78	Prehistoric	Rock Rings
77-014-018	35KL79	Prehistoric	Petroglyphs
77-014-019	35KL104	Prehistoric	Rock Ring
77-014-022	35KL52	Prehistoric	Rock Ring
76-014-002	35KL60	Prehistoric	Lithic Scatter
76-014-006	35KL66	Prehistoric	Lithic Scatter
76-014-008	35KL70	Prehistoric	Rock Rings
76-014-009	35KL71	Prehistoric	Lithic Scatter
76-014-010/012	35KL72	Prehistoric	Rock Ring/Lithic Scatter
76-014-011	35KL64	Prehistoric	Rock Rings
76-014-013	35KL80	Prehistoric	Rock Rings
76-014-013	35KL74	Prehistoric	Lithic Scatter/Rock Cairns
76-014-015	35KL82	Prehistoric	Rock Rings
76-014-017	35KL84	Prehistoric	Rock Rings
76-014-018	35KL086	Prehistoric	Village
76-014-019	35KL087	Prehistoric	Village
76-014-023	35KL65	Inadequate Info	Inadequate Information
76-014-024	35KL85	Inadequate Info	Inadequate Information
76-024-001	35KL59	Prehistoric	Lithic Scatter
74-014-001	35KL37	Prehistoric	Village
74-014-002	35KL38	Prehistoric	Campsite/Lithic Scatter
74-014-003	35KL39	Prehistoric	Lithic Scatter
74-014-004	35KL40	Prehistoric	Campsite/Lithic Scatter
74-014-005	35KL41	Prehistoric	Campsite/Lithic Scatter
?	35KL98	Inadequate Info	Inadequate Information

USFS Field Number	Permanent Trinomial	Cultural Period	Site Type
FS-05-09-56-0031	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0032	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0036	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0036	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0036	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0036	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0036	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0043	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0044	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0045	CA-Mod-1132	Prehistoric	Seasonal Camp
FS-05-09-56-0046	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0048	CA-Mod-1135	Prehistoric	Temporary Camp
FS-05-09-56-0050	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0051	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0052	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0053	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-0054	CA-Mod-1141	Prehistoric	Temporary Camp
FS-05-09-56-0055	CA-Mod-1142	Prehistoric	Lithic Scatter
FS-05-09-56-0056	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-1009	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-1566	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-1567	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-1575/H	CA-Mod-	Multi-Component	Temporary Camp/Can Dump
FS-05-09-56-1580	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2029	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2185	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2231	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2238	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2246	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2250	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2251	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2252	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2253	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2254	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2258	CA-Mod-	Prehistoric	Inadequate Information
FS-05-09-56-2261	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2262	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2264	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2265	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2266/H	CA-Mod-	Multi-Component	Seasonal Camp/Can Dump
FS-05-09-56-2267	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2268	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2269	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2270	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2271	CA-Mod-	Prehistoric	Rock Cairn
FS-05-09-56-2272	CA-Mod-	Prehistoric	Rock Ring
FS-05-09-56-2273	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2274	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2275	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2276	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2277	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2278	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2279	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2280	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2281	CA-Mod-	Prehistoric	Temporary Camp

FS-05-09-56-2282	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2283	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2284	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2285	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2286	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2287	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2288	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2289	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2290	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2291	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2292	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2293	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2294	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2300	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2301	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2302	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2303	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2304	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2305	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2306	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2307	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2308	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2309	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2324	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2325	CA-Mod-	Prehistoric	Groundstone
FS-05-09-56-2326	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2328	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2329	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2330	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2331	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2332	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2333	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2334	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2521	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2522	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2523	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2524	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2525	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2526	CA-Mod-	Prehistoric	Groundstone
FS-05-09-56-2527	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2529	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2530	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2739	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2740	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2741	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2741	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2742	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2743	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2744	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2745	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2746	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2747	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2748	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2749	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2750	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2751	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2753	CA-Mod-	Prehistoric	Lithic Scatter

FS-05-09-56-2800	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2801	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2802	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2803/H	CA-Mod-	Multi-Component	Lithic Scatter/Ranch Camp
FS-05-09-56-2808	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2809	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2810	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2813	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2814	CA-Mod-	Prehistoric	Lithic Scatter
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FS-05-09-56-2816	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2817	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2818	CA-Mod-	Prehistoric	Lithic Scatter
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FS-05-09-56-2821	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2822	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2823	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2824	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2826	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2828	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2829	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2830	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2831	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2832	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2833	CA-Mod-	Prehistoric	Lithic Scatter
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FS-05-09-56-2836	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2837	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2838	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2839	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2840	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2841	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2844	CA-Mod-	Prehistoric	Seasonal Camp
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FS-05-09-56-2846	CA-Mod-	Prehistoric	Rock Cairn
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FS-05-09-56-2848	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2849	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2850	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2851	CA-Mod-	Prehistoric	Lithic Scatter
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FS-05-09-56-2853/H	CA-Mod-	Multi-Component	Temporary Camp/Can Dump
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FS-05-09-56-2877	CA-Mod-	Prehistoric	Lithic Scatter
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FS-05-09-56-2881	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2882	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2883	CA-Mod-	Prehistoric	Seasonal Camp
FS-05-09-56-2884	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2885	CA-Mod-	Prehistoric	Village Site
FS-05-09-56-2886	CA-Mod-	Prehistoric	Village Site
FS-05-09-56-2887	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2888	CA-Mod-	Prehistoric	Temporary Camp

FS-05-09-56-2889	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2890	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2891	CA-Mod-	Prehistoric	Lithic Scatter
FS-05-09-56-2892	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2893	CA-Mod-	Prehistoric	Temporary Camp
FS-05-09-56-2895	CA-Mod-	Prehistoric	Temporary Camp
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FS-05-09-56-2903	CA-Mod-	Prehistoric	Lithic Scatter
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BLY-Pooch T.S.	35KL-	Prehistoric	Inadequate Information
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BLY-Good Salvage	35KL-	Prehistoric	Inadequate Information
BLY-Good Salvage	35KL-	Prehistoric	Inadequate Information

BLY-Good Salvage	35KL-	Prehistoric	Inadequate Information
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BLY-Keno Analysis	35KL-	Historic	Inadequate Information
BLY-Keno Analysis	35KL-	Historic	Inadequate Information
Fremont-Buzzard Salvage	35KL-	Historic	CCC wooden water troughs
Fremont-Buzzard Salvage	35KL-	Prehistoric	Lithic Scatter
LK-1848 (Buzzard)	35KL-	Prehistoric	Lithic Scatter
LK-1846 (Buzzard)	35KL-	Prehistoric	Lithic Scatter
LK-1847 (Buzzard)	35KL-	Prehistoric	Lithic Scatter

LK-1845 (Buzzard)	35KL-	Prehistoric	Lithic Scatter
02-BZ-P-01 (Buzzard)	35KL-	Prehistoric	Hunting Blind
02-BZ-P-02 (Buzzard)	35KL-	Prehistoric	Lithic Scatter
02-BT-P-01 (Brushy Thin)	35KL-	Prehistoric	Lithic Scatter
02-MU-H-01 (Mud T.S)	35KL-	Historic	CCC Cronin Reservoir Dam
02-MU-P-01 (Mud T.S.)	35KL-	Prehistoric	Lithic Scatter
02-MU-P-02 (Mud T.S.)	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL848	Historic	Inadequate Information
02-LS-P-01 (Last Straw)	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter
Fremont-Last Straw T.S.	35KL-	Prehistoric	Lithic Scatter

APPENDIX C - RANGELAND HEALTH DETERMINATION

Gerber/ Willow Valley Watershed Analysis
Rangeland Health Standards Assessments

Rangeland Health Determination

Bureau of Land Management policy and direction articulates a preference that Rangeland Health Standards Assessments (RHSAs) be conducted at the watershed scale. The *Gerber/Willow Valley Watershed Analysis* (GWA) is considered the *Rangeland Health Standards Assessment* for eight BLM administered grazing allotments within the GWA area. These allotments are: **"J" Spring, Paddock, Bumpheads, DeVaul, Goodlow, Pankey Basin, Horse Camp Rim**, and **Rock Creek**. The other ten BLM grazing allotments in the analysis area were individually assessed between 1999 and 2002. The GWA reiterated pertinent information from each of the ten completed RHSAs, but did not formally re-assess them since the assessments are recent and up-to-date.

This document is tiered to the GWA and is the formal "determination" documentation for those eight assessed allotments, as required by policy and outlined in the *Rangeland Health Standards Handbook* (H-4180-1). The determination makes the "call" as to whether current grazing management is meeting or not meeting the five Oregon/Washington "Standards for Rangeland Health", or is not meeting the Standards but management is making "significant progress" towards meeting them.

The following eight allotment-specific determinations are based on the analysis and individual Standards & Guidelines determinations performed in the GWA ***Step 5 – Human Uses, Grazing.*** The GWA's ***Step 6 – Management Recommendations*** contains proposed management and monitoring for all of the GWA covered allotments, including the eight assessed allotments. This section is mostly grazing related but does contain some non-grazing management recommendations such as juniper control. Refer to these portions of the GWA for more information.

* * *

<u>"J" Spring Allotment</u> (#0803) – All five Standards were determined to be fully "met" and current grazing management conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the "J" Spring allotment.

<u>Paddock Allotment</u> (#0844) - All five Standards were determined to be fully "met" and current grazing management conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the Paddock allotment.

<u>Bumpheads Allotment</u> (#0877) – Standards 1, 3, and 5 were determined to be fully "met", but Standards 2 (Riparian/Wetland) & 4 (Water Quality) were determined to be "not met" and livestock grazing was a contributing factor for at least Standard 2. Grazing management should be modified as outlined in the GWA Step 6 – "Management Recommendations" section for the Bumpheads allotment.

<u>DeVaul Allotment</u> (#0879) - All five Standards were determined to be fully "met" and current grazing management conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the DeVaul allotment.

<u>Goodlow Allotment</u> (#0881) - All five Standards were determined to be fully "met" and current grazing management conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the Goodlow allotment.

<u>Pankey Basin Allotment</u> (#0884) - Standards 1, 3, 4, and 5 were determined to be fully "met", but Standard 2 (Riparian/Wetland) was determined to be "not met" and livestock grazing was a contributing factor. Grazing management should be modified as outlined in the GWA Step 6 – "Management Recommendations" section for the Pankey allotment.

<u>Horse Camp Rim Allotment</u> (#0886) – Standards 1, 3, and 5 were determined to be "met". Current management was determined to be making "substantial progress towards meeting" Standards 2 (Riparian/Wetland) and 4 (Water Quality). Current grazing management also conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the Horse Camp Rim allotment.

<u>Rock Creek Allotment</u> (#0888) - Standards 1, 3, and 5 were determined to be "met". Standard 2 (Riparian/Wetland) was determined to be "not met but livestock grazing not responsible". Progress toward meeting Standard 4 (Water Quality) could not be determined with current information. Current grazing management also conforms with the "Guidelines for Livestock Grazing Management". Grazing management and monitoring is recommended to continue as described in the GWA Steps 3 & 6 for the Rock Creek allotment.

Field Manager, Klamath Falls Resource Area	June 10, 2003 **Date**

APPENDIX D - REFERENCE LIST

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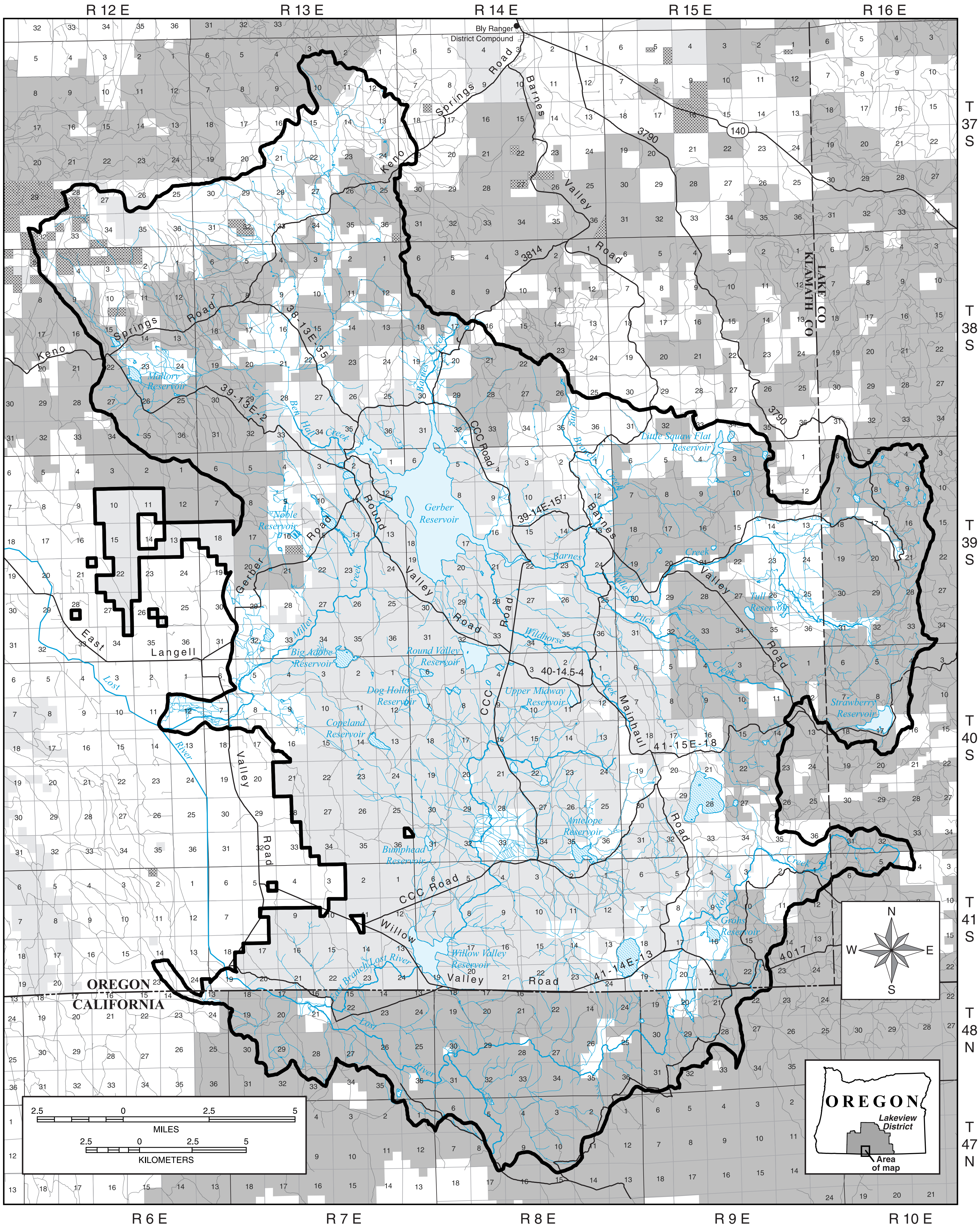
APPENDIX E - MAPS



Legend

Analysis Area Boundary
Major Road
Road
Major Stream
Stream

Lake or Reservoir
Wetland or Marsh

Administered Land
State of Oregon
US Forest Service
Bureau of Land Management
Private

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2003

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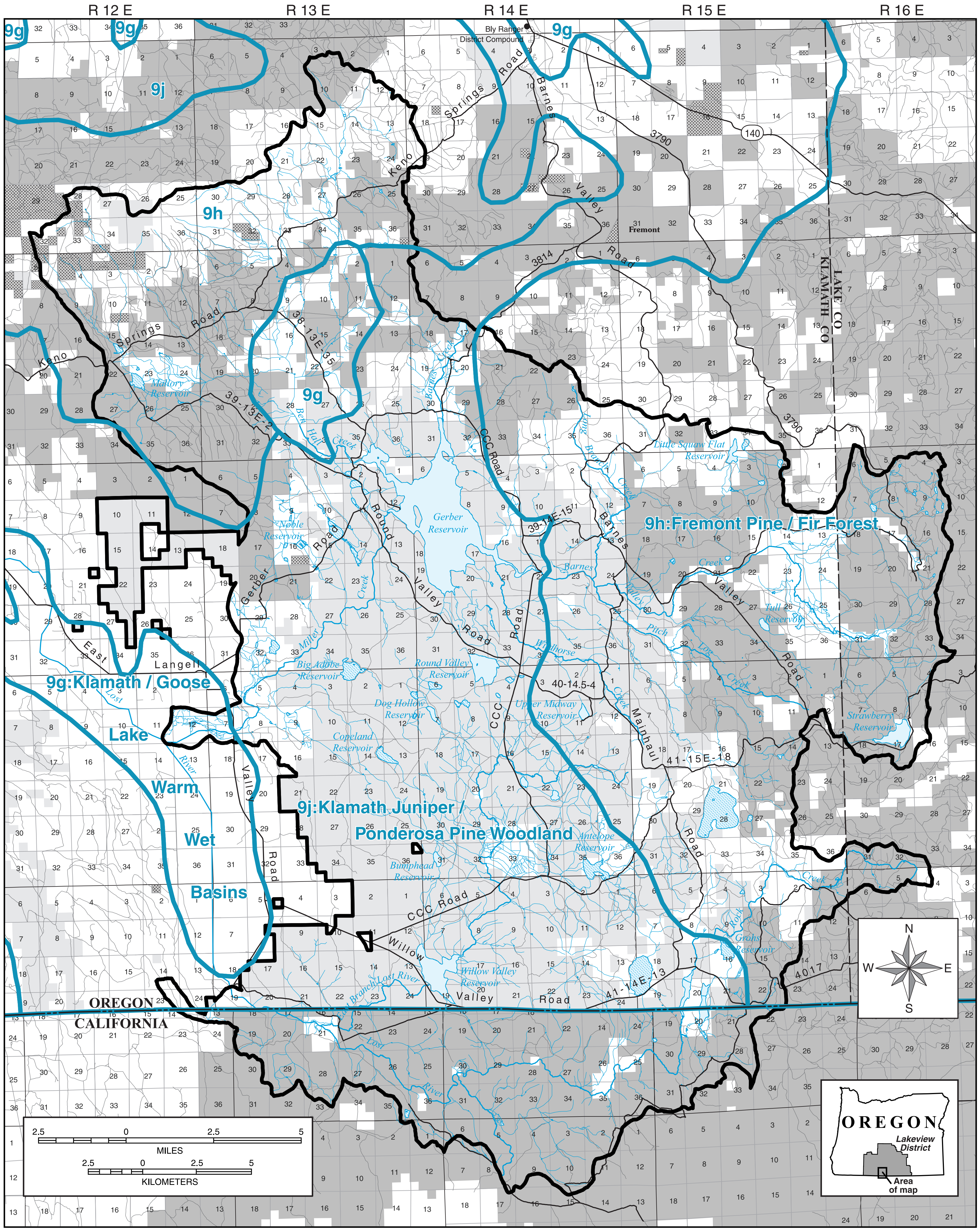
Map 1-1: Land Status



Legend

Ecoregion Boundary
Analysis Area Boundary
Major Road
Road
Major Stream
Stream

Lake or Reservoir
Wetland or Marsh
Administered Land
State of Oregon
US Forest Service
Bureau of Land Management
Private

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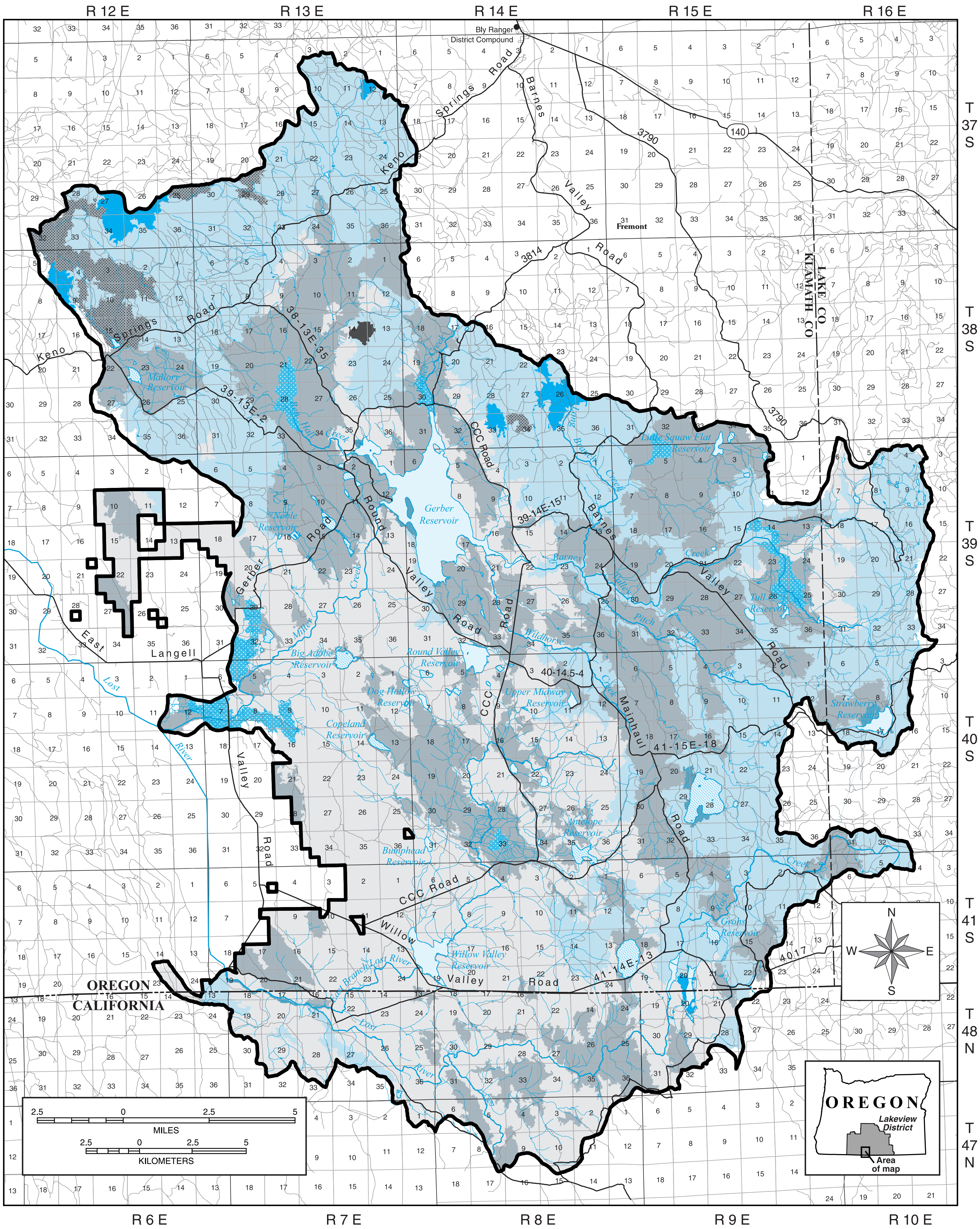
Map 1-2: Level IV Ecoregions of Oregon



Legend

Dominant Vegetation Type

- Agriculture
- Juniper
- Mixed Conifer
- Mt Mahogany
- Ponderosa Pine
- Regen
- Sagebrush
- Riparian

- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

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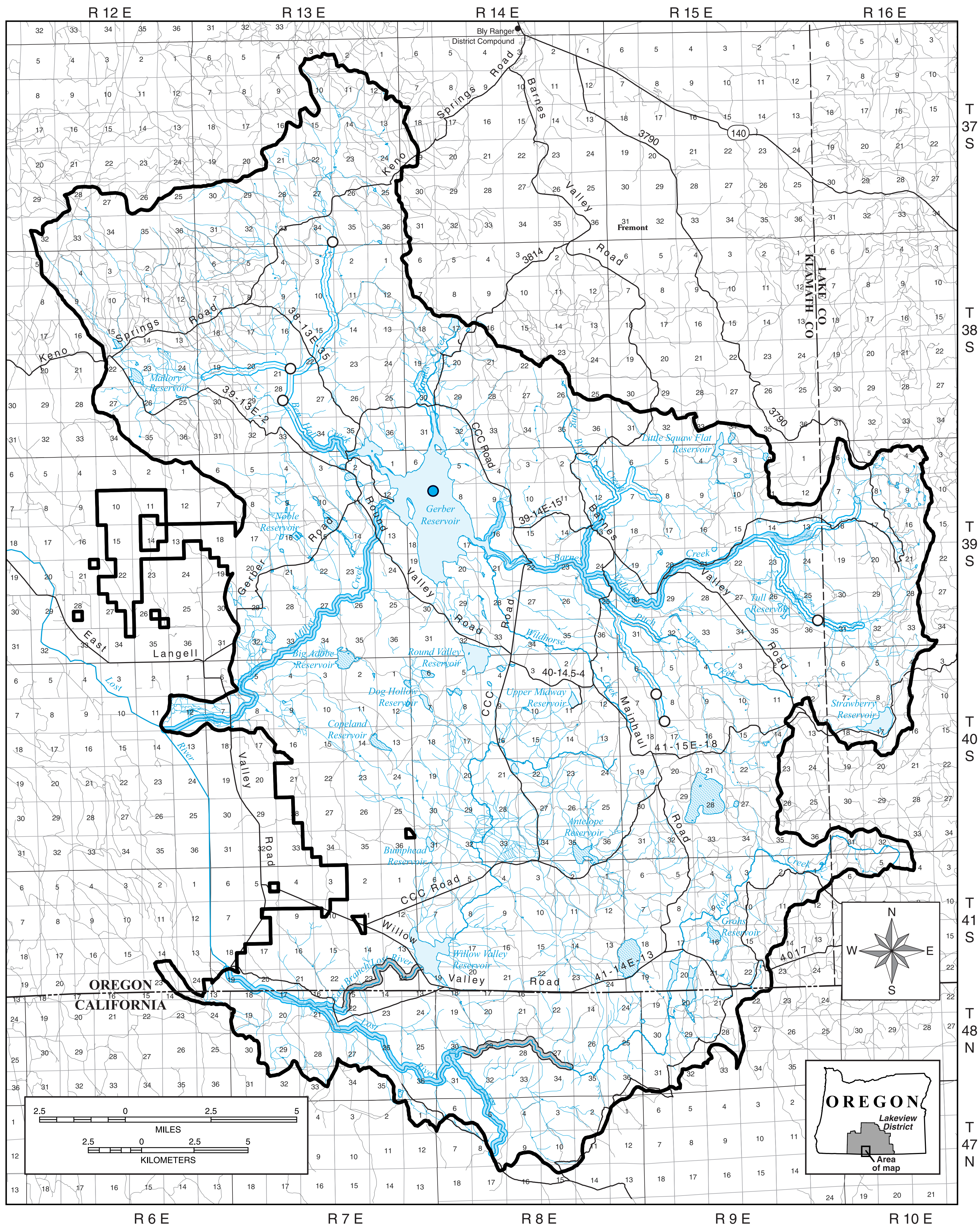
Map 1-3: Generalized Vegetation and Forest Community Types in Analysis Area



Legend

All Species: Large Scale Sucker, Lost River Sucker, Short Nose Sucker, Redband Trout

- Presence Verified in Stream
- Presence Not Verified in Stream
- Presence Verified in Lake / Reservoir
- Presence Not Verified in Lake / Reservoir

Red Band Trout Only

- Presence Verified in Stream

- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

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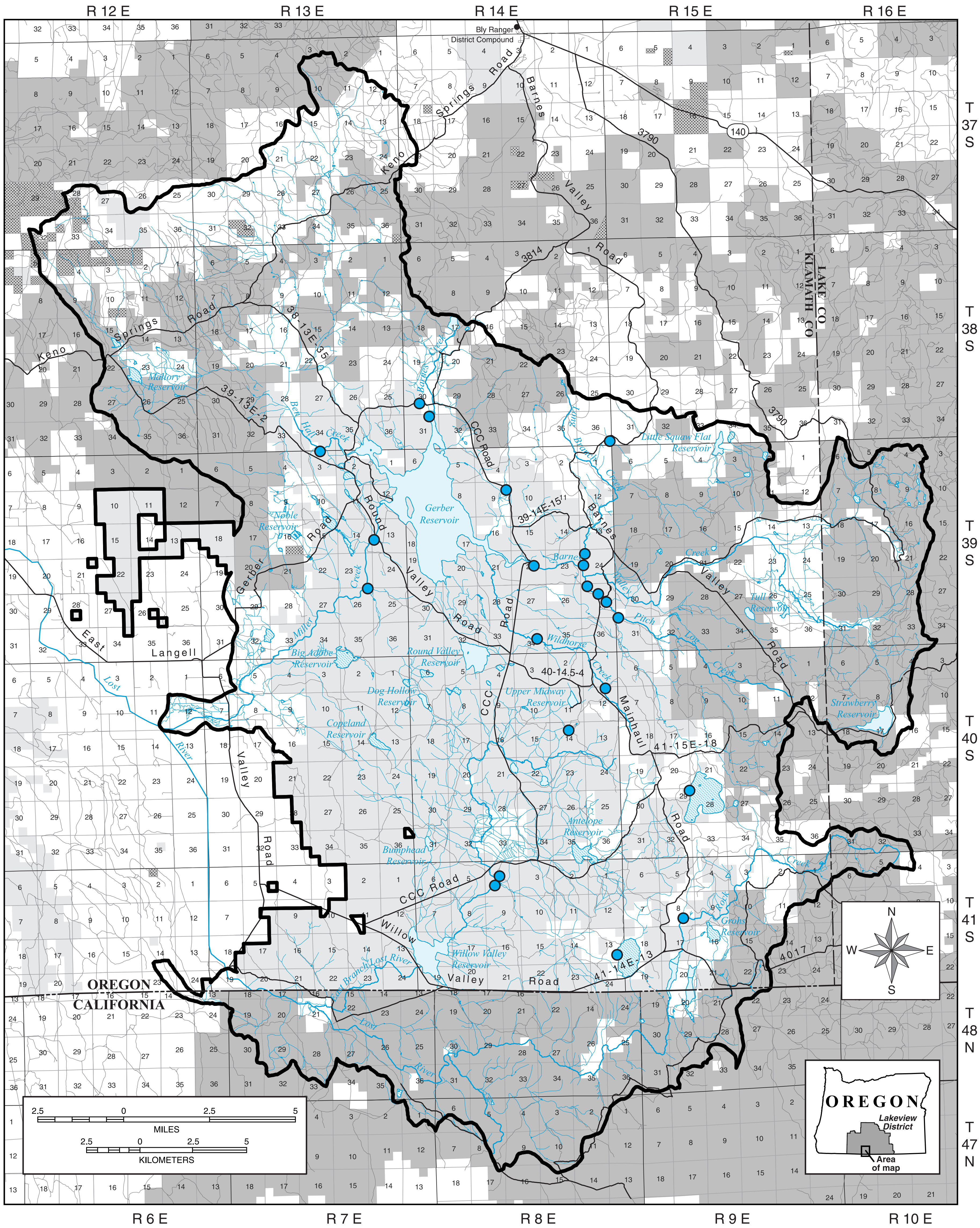
Map 3-1: Fish Distribution



Legend

- Aspen Stand Location
- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

Administered Land

- State of Oregon
- US Forest Service
- Bureau of Land Management
- Private

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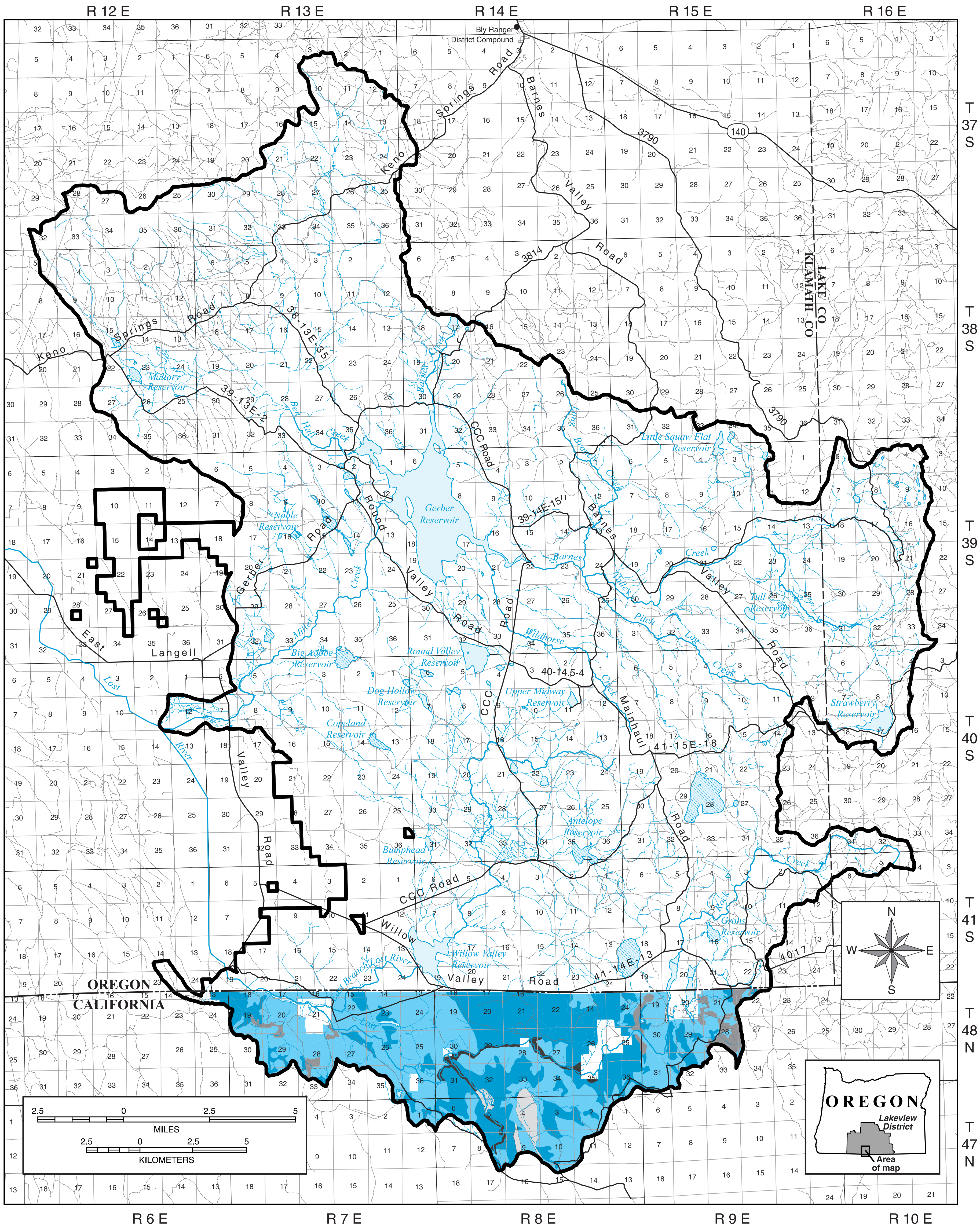
Map 3-2: Aspen Stands



Legend

Species

- Weed / Annual Grasses
- Juniper
- White Pine
- Pine
- Sagebrush
- Barren / Water

- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

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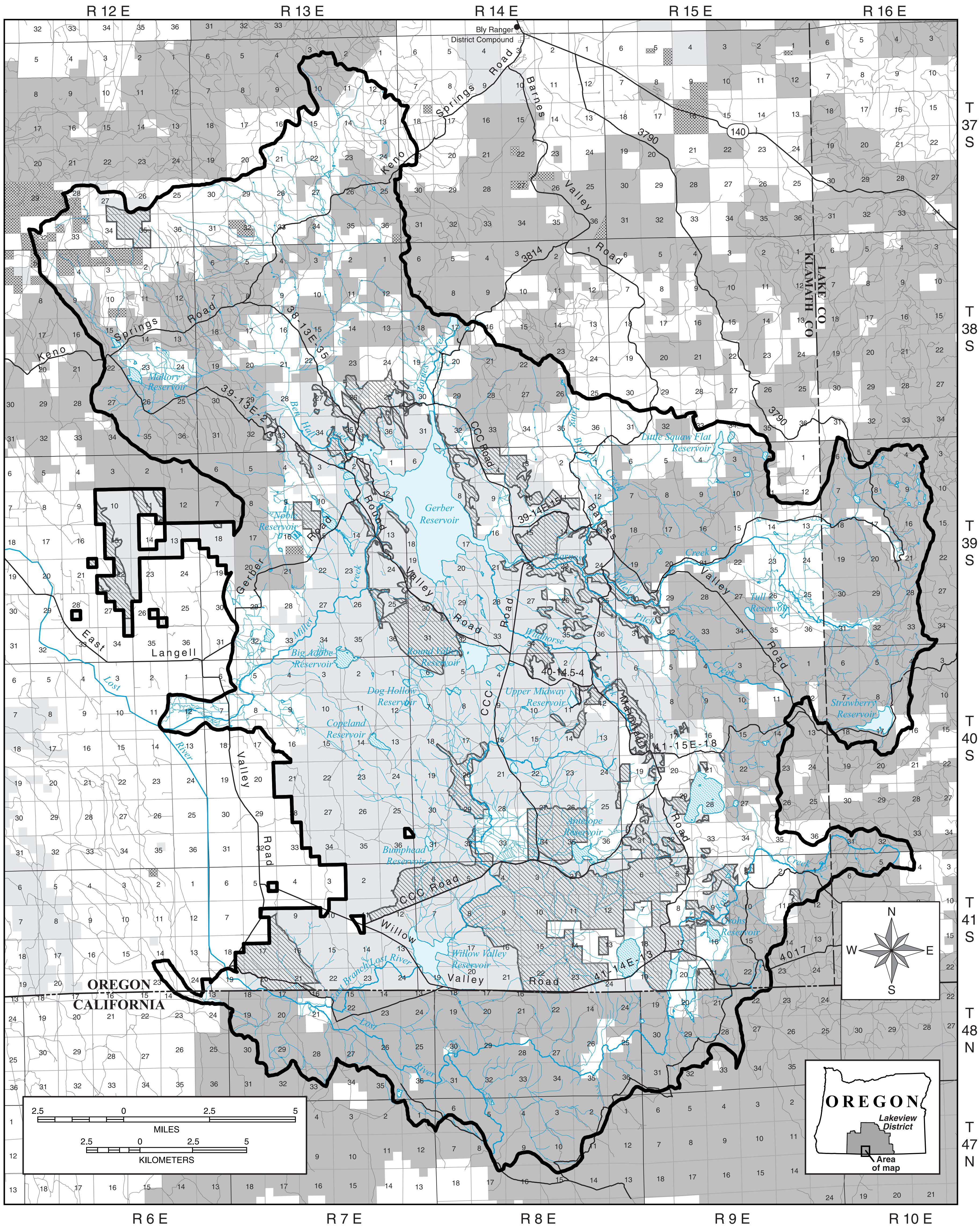
Map 3-3: Modoc National Forest Vegetation Types



Legend

- Fuel Treatment Area
- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

Administered Land

- State of Oregon
- US Forest Service
- Bureau of Land Management
- Private

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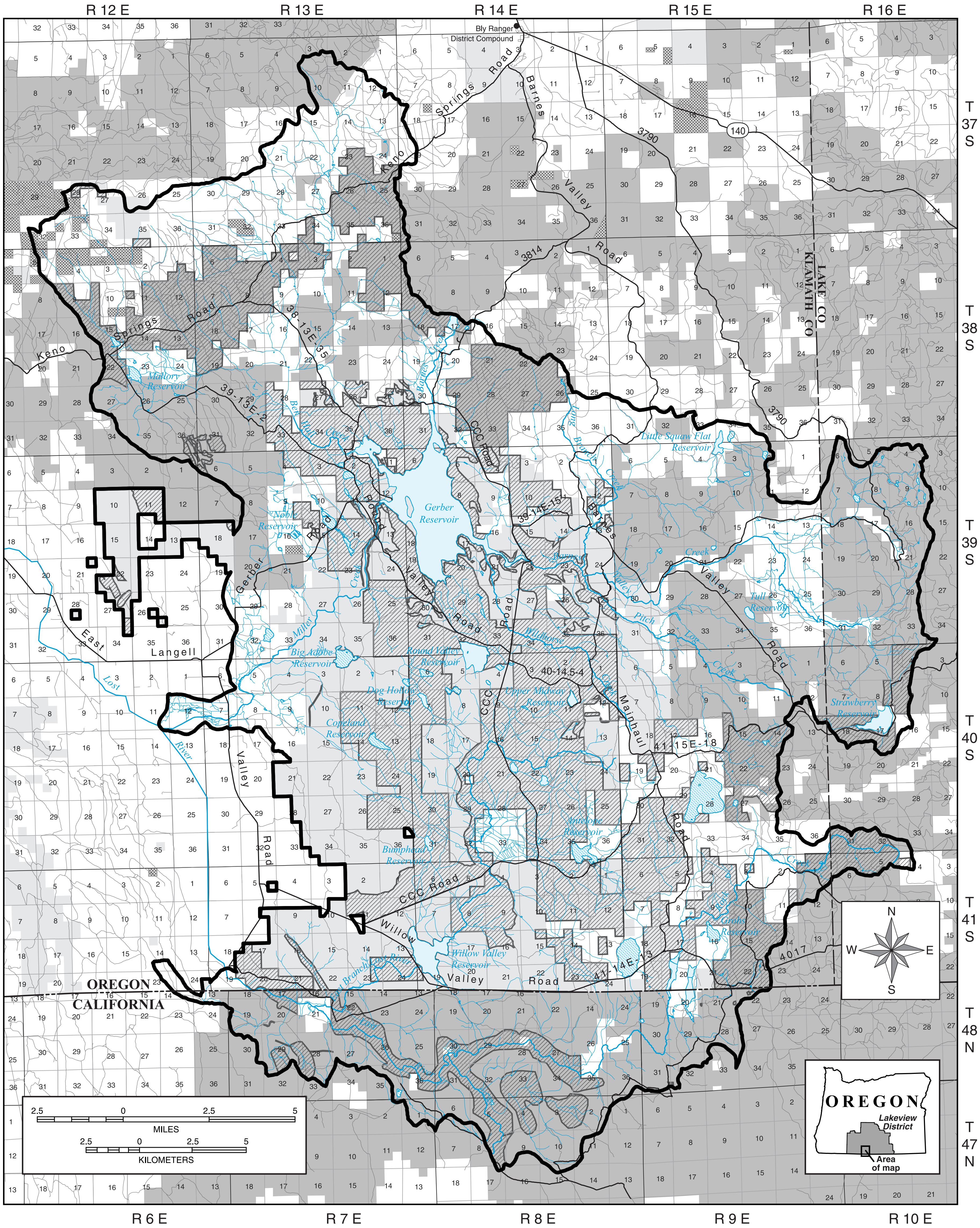
Map 3-4: Fuel Treatments



Legend

- Surveyed Area
- Analysis Area Boundary
- Major Road
- Road
- Major Stream
- Stream
- Lake or Reservoir
- Wetland or Marsh

Administered Land

- State of Oregon
- US Forest Service
- Bureau of Land Management
- Private

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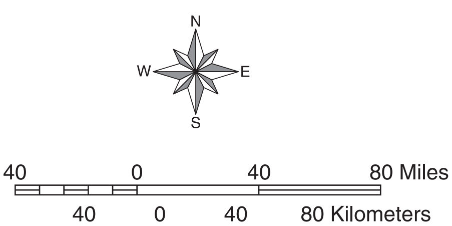
Map 3-5: Areas Surveyed for Cultural Resources



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Location of the Gerber-Willow Valley Watershed

D05-07-03:PF:062303