Chapter 3

Affected Environment

Introduction

This chapter presents an overview of conditions, land uses, and resources as a foundation for understanding the changes that would take place in response to the alternatives discussed in Chapter 2. It describes the physical, biological, social, and economic environments of the Ochoco National Forest and Crooked River National Grassland. The following is a list of the resources that will be discussed.

AIR QUALITY
BIOLOGICAL DIVERSITY
CULTURAL RESOURCES
FACILITIES
FIRE
FORAGE
FOREST HEALTH
FOREST RESIDUES
FUELWOOD
LANDS
MINERALS AND ENERGY
OLD GROWTH:
RECREATION
SCENIC RESOURCES
SOCIAL AND ECONOMIC
SOIL
TIMBER
TRANSPORTATION SYSTEM
UNROADED
WATER
WILD AND SCENIC
WILDERNESS
WILDLIFE AND FISH

Changes between Draft and Final

As a result of public comments, Forest management activity, and Congressional action, Chapter 3 of the DEIS has been updated to accurately reflect the significant environmental changes. Data included on population, incomes, harvest volumes, operating costs, and revenues have been updated to the most current figures available. In addition, portions of the text have been reorganized and rewritten to improve clarity and readability. Significant additions are:

A discussion in the Recreation Section of the Oregon Omnibus Wild and Scenic Rivers Act, and the eligibility and suitability of a 1,370 acre segment of Squaw Creek for possible designation to the Wild and Scenic River System;

A major section on Biological Diversity;

A major section on Old Growth with updated inventory figures;

A section on Forest Health which places the former Forest Pest: : discussion in an ecological context;

A section on Forage which mentions uses of the resource other than for livestock grazing;

A discussion of the Cultural Resource Inventory Plan in the Cultural Resource Section,

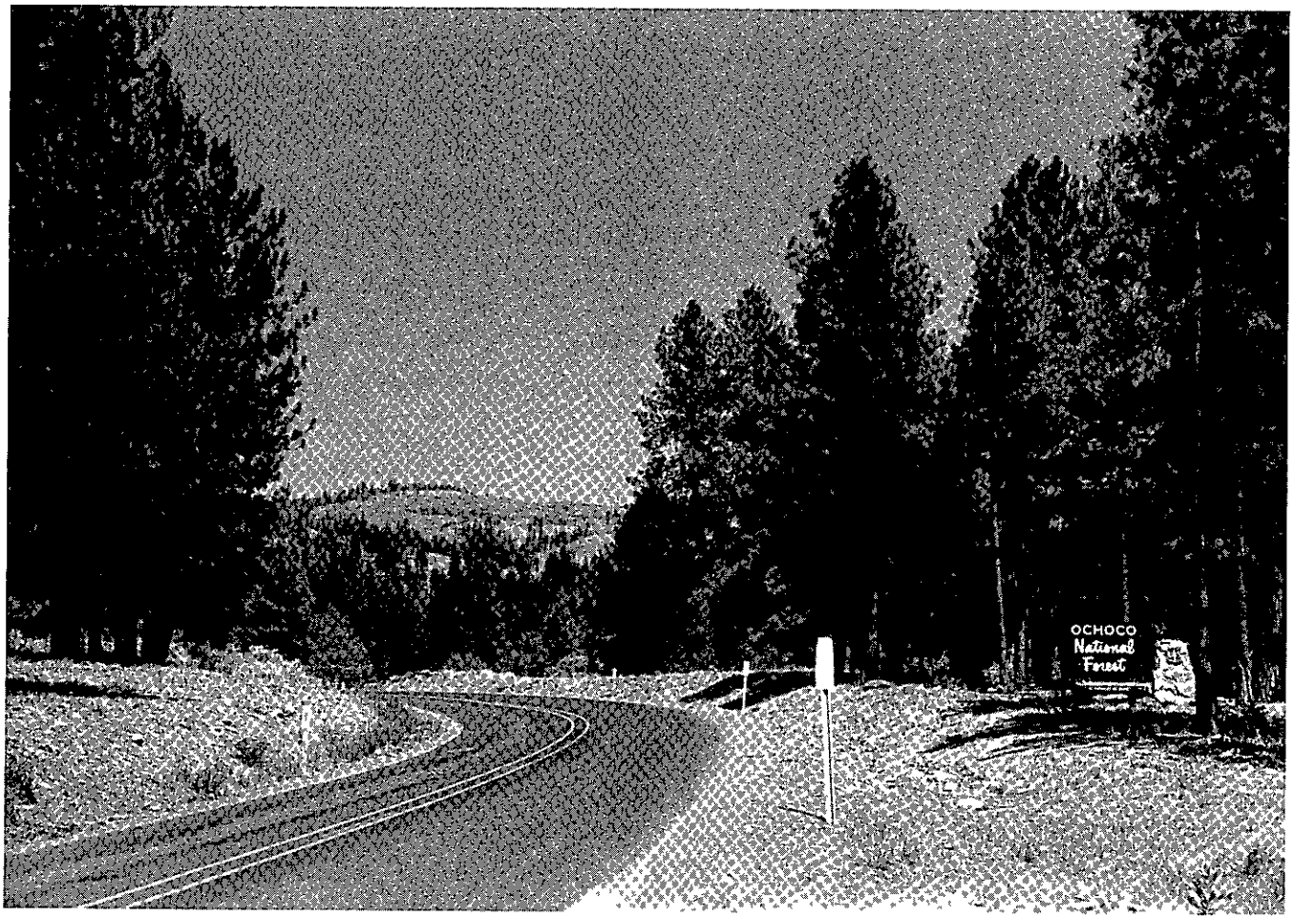
A discussion of the Ochoco National Forest and Crooked River National Grassland's unique contributions to the State's economy in the Social and Economic section; and

A discussion of the supply and demand for timber at the national, regional, and local levels in the Timber Section.

Location

The Ochoco National Forest and Crooked River National Grassland are located near the geographic center of Oregon (Figure 1-1). Combined, they occupy approximately 956,877 acres in the southern part of the Blue Mountain Physiographic Province, which includes the Blue, Ochoco, and Maury Mountains.

Being too large to effectively administer as one unit, the Blue Mountain Reserve was split, by Executive Order, into four National Forests on July 1, 1908, thus forming the Deschutes, Malheur, Whitman, and Umatilla National Forests. The Ochoco National Forest was created in 1911, by combining parts of the Deschutes and Malheur National Forests.



Headquartered in Prineville, the Ochoco National Forest is part of the former Blue Mountain Reserve. The reserve, established in 1906 by President Theodore Roosevelt, was divided into east and west units

In 1960, the 111,379-acre Crooked River National Grassland came under the administration of the Ochoco National Forest. The land was returned to government ownership in the late 1930's, with the purchase of submarginal and drought-stricken homesteaded lands under the Resettlement Administration and the Bankhead-Jones Act.

Land Ownership

Land Ownership in the Ochoco National Forest and Crooked River National Grassland is fairly well consolidated in four parcels of land in five counties. Crook, Harney, Jefferson, Wheeler, and Grant Counties are home to the Ochoco National Forest and Crooked River National Grassland.

Parcels of land belonging to the Bureau of Land Management, State of Oregon, and private parties are intermingled and border the Ochoco National Forest. Management of these lands within the boundaries of the Ochoco National Forest can, and may continue to, conflict with the management of the Ochoco National Forest. Adverse impacts on resources may result, and the potential for trespass is also a possibility.

Climate

The climate of the Ochoco National Forest and Crooked River National Grassland is relatively arid. Annual precipitation ranges from less than 10 inches to over 30 inches at higher elevations. The Cascade Mountain Range intercepts much of the moisture-laden air coming from the Pacific Ocean. Areas to the east of the Cascades are in a "rain shadow.": The climatic effects of the rain shadow and central Oregon's elevation are low relative humidity, low rainfall, large daily temperature fluctuations, and cool average temperatures. The central Oregon area is often referred to as a "high desert."

Geology and Topography

The Ochoco National Forest includes moderate to gentle slopes with elevations ranging from 2,200 to 7,000 feet. The Crooked River National Grassland consists of rolling range interspersed with deep canyons and volcanic buttes.

The physiographic province of the Blue Mountains provides the diverse topography of the Ochoco National Forest. Mountain ranges, faulted valleys, and synclinal basins formed through time by volcanic activity have left some of the oldest rocks in Oregon in the Ochoco National Forest. Around the Forest's periphery are some very rugged canyons and buttes with steep slopes and rock outcrops.

The Crooked River National Grassland is located in four major physiographic provinces:: the Rolling Hills, the Mid-basin Plains, the Mid-basin Lava Buttes, and the East Cascade Plateau. The Crooked River National Grassland consists of rolling range country interspersed with deep canyons and volcanic buttes. The buttes are found mostly in the southern portion of the Crooked River National Grassland. The canyons generally run south to north and were formed by the Crooked and Deschutes Rivers.

Resources

Timber harvest has a large economic influence in the five counties in which the Ochoco National Forest is located. The revenues generated from timber harvest not only provide income for the timber industry, but also to the economy of the counties as a whole.

Summer forage is an important part of the Ochoco National Forest and Crooked River National Grassland. Cattle and sheep belonging to 115 permittees graze annually. This amounts to 75,000 animal unit months (AUM's).

The Forest and Grassland provide a variety of habitat for an estimated 350 to 400 wildlife species. Hunting and viewing big game are major recreational attractions. The Oregon Department of Fish and Wildlife coordinates management activities with the habitat provided by the Forest and Grassland: producing an estimated 22,600 mule deer, 2,300 elk, and 750 antelope. Other significant habitats provided by the Ochoco National Forest and Crooked

River National Grassland include old growth, snags, and riparian areas.

More than 500 miles of streams support cold water fisheries. Approximately 200 additional miles of streams have the potential to support cold water fisheries, however, due to low flows, high water temperatures, and lack of pools, fish habitat is sometimes greatly reduced in the summer. A few streams on the Ochoco National Forest that are part of the John Day and Deschutes River drainages provide conditions for limited anadromous fish spawning. Average annual runoff from the Ochoco National Forest is estimated to be 574,000 acre feet.

Recreational opportunities vary from rockhounding to snowmobiling, and include horseback riding, driving for pleasure, camping, hunting, fishing, and cross country skiing. Various boating, camping, and picnicking sites exist throughout the Ochoco National Forest and Crooked River National Grassland.

Camping is a major recreational use. Water-related sites, and those along main transportation routes, are heavily used. Use on weekends and holidays varies from 80 to 130 percent of developed capacity. The more remote sites are, in general, lightly used except during holidays and hunting season. Total recreation visitor days are estimated to be 430,000 annually.

Three classified wilderness areas, and one "further study" area lie within the Ochoco National Forest and Crooked River National Grassland. One Research Natural Area has been designated, and five others have been proposed. Over 1700 cultural resource sites have been documented, with about 1000 of these being prehistoric sites.

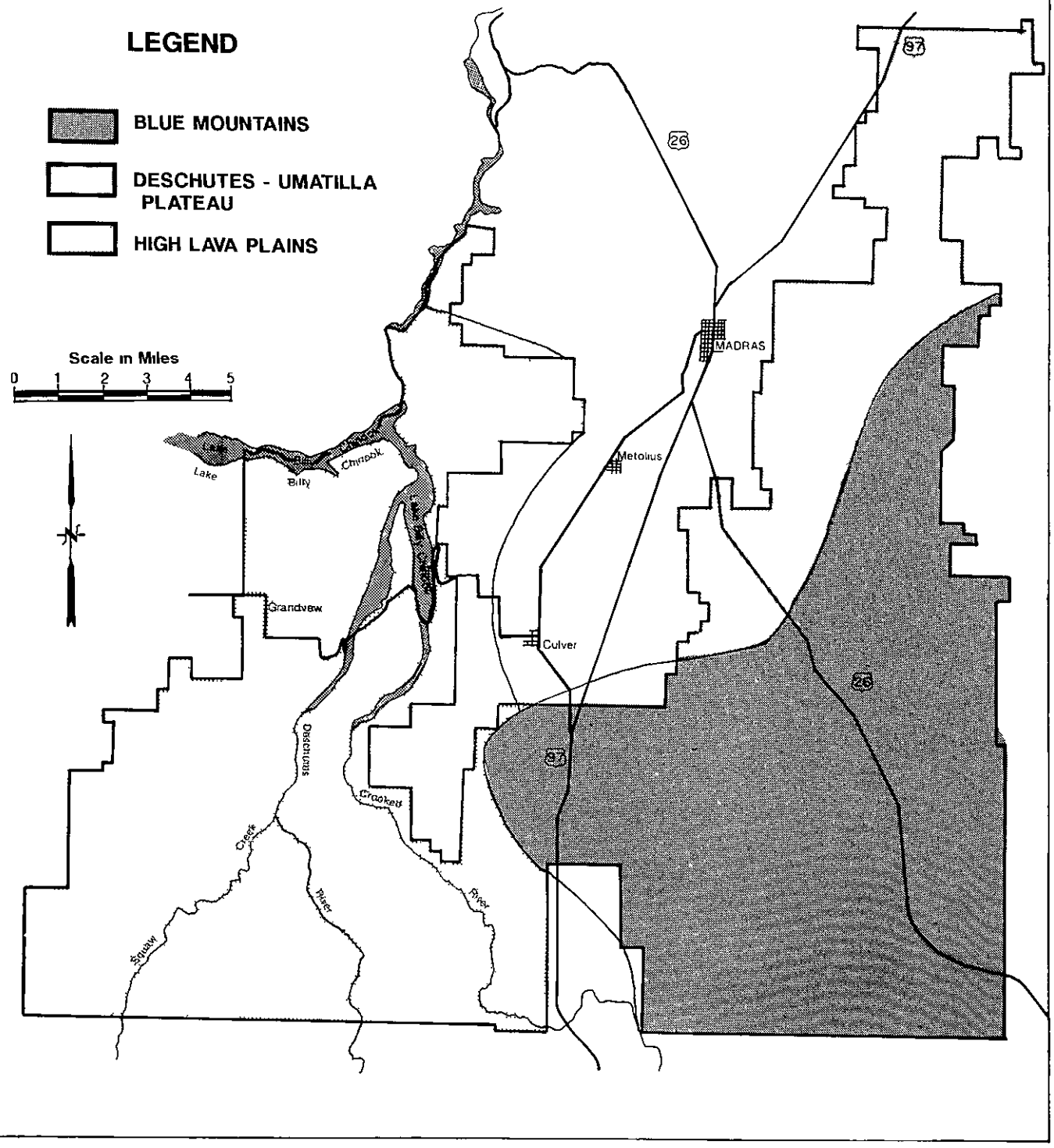
Mineral activities and mining claims, though generally not commercially productive, exist on the Ochoco National Forest. Some minor prospecting for cinnabar and gold occurs. A major activity is hunting for semiprecious stones. About 800,000 acres have been identified as having significant oil and gas potential, and over 20 percent of the Ochoco National Forest and Crooked River National Grassland is leased for possible oil and gas exploration and development.

The area's vegetation has been described in detail by Hopkins and Kovalchik in "Plant Associations of the Crooked River National Crooked River National Grassland" (1983), by Hall in "Plant Communities of the Blue Mountains in Eastern Oregon and Southeastern Washington" (1973), and by Kovalchik in "Riparian Zone Associations, Deschutes, Ochoco, Fremont, and Winema National Forests" (1987).

Soils on the Ochoco National Forest and Crooked River National Grassland have developed under the influence of a semi-arid climate from parent material of principally volcanic origin. North slope surface soils are primarily recent ash deposits. Good water permeability is associated with deeper soils. Lower elevation soils range from silt loam to sandy loams. Rocky areas of very thin soil and low productivity, called "scablands," occur in places.

Figure 3-1

PHYSIOGRAPHIC PROVINCES



Air Quality

National Ambient Air Quality Standards have been developed by the Environmental Protection Agency under authority of the Clean Air Act Amendments (PL 91-604). The standards establish acceptable levels for certain pollutants including total suspended particulates (TSP). Although air quality surfaced as an issue during scoping for the Regional Guide, it is closely tied to Forest issues relating to residue management, visuals, and any other use of fire to protect and enhance Forest resources.

A potential for short-term air quality impairment from dust is created by a variety of management practices. Machinery operations related to timber harvest often raise clouds of dust. Log hauling on roads is another source of dust as is prescribed burned areas on windy days. Road construction and maintenance machinery operations are also dust contributors, both in the actual road work and in the rock crushing operations. The impacts are usually of a local nature and of short duration.

Visibility on and adjacent to the Ochoco National Forest and Crooked River National Grassland is affected by the emission of suspended particulates from fire. The Bend-Redmond-Madras-Prineville area experiences regional haze problems several times each year due to an accumulation of smoke from numerous agricultural and wildland burns, from local fires and from fires west of the Cascades. The contribution of smoke from west of the Cascades is occasionally great enough to cause voluntary curtailment of local burning to avoid further degradation. Regional data, presented in the Final Environmental Impact Statement for the Pacific Northwest Regional Guide (May 1984), indicates that the Ochoco National Forest contributes approximately 30 percent of the emissions generated in the Bend-Redmond-Madras-Prineville area. These emissions come almost entirely from prescribed fire.

Fire has been used on the Ochoco National Forest and Crooked River National Grassland to treat slash, to manage wildlife habitat, and to improve forage for livestock. Records show a steady increase in the use of prescribed fires over the past two decades. As a result, the number of days per year with reduced visibility have also increased.

The primary use of fire has been to treat timber harvest residues (slash). Currently, prescribed fire is used to treat 15-20 thousand acres of slash annually from past and current timber sales. This activity produces 8 to 14 thousand tons of total suspended particulates (TSP) in smoke emissions. Most of this activity occurs in spring and fall. The TSP production for wildfires is highly variable. Estimates range from 25 tons in years of infrequent wildfires to 4000 tons in years of numerous wildfires.

Biological Diversity

Biological diversity refers to the distribution and abundance of plant and animal species and communities on the Ochoco National Forest. Elements of biological diversity include, but are not limited to:

Viability, distribution and abundance of wildlife and plant populations;

Structure and composition of forests;

The role of agents such as fire and insects;

Long-term productivity, and

Fragmentation of scarce community types.

The law (36 CFR 219.27) requires that management prescriptions, where appropriate and to the extent practical, preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species. These communities should be at least as great as those expected in a "natural" Forest, and the diversity of tree species should be similar to that existing in the planning area. Reduction in diversity may be prescribed only where needed to meet overall multiple-use objectives. A discussion of the biological processes occurring on the Ochoco National Forest is basic to an understanding of whether or not management practices have the potential for adversely altering diversity.

Detailed discussions of individual elements that comprise biological diversity are included in other sections of this chapter, e.g. Soils, Wildlife and Fish. To avoid repetition, discussions of biological diversity elements presented here have been summarized or cross-referenced, where appropriate.

Biological Processes and Long-Term Productivity

Soil

Soil, a basic nonrenewable resource, is the foundation on which biological diversity is maintained. All plant and animal life on the Forest and Grassland is either directly or indirectly dependent on maintenance of long-term productivity of our soils. By definition, the components of long-term soil productivity include:

Surface litter and topsoil layers;

Soil organic matter and it's replacement,

Soil organisms and biological systems; and

Soil porosity, structure, drainage and aeration.

Three general soil types occur on the Ochoco National Forest. Each of these types reacts somewhat differently to management activities and possibly to other outside influences such as pollutants and atmospheric depositions.

TABLE 3-1
Diversity of Soil Types

SOIL TYPE	PERCENT OF FOREST AND GRASSLAND	MANAGEMENT HAZARDS/LIMITATIONS
Volcanic Ash	30	High compaction and displacement hazard under a wide range of soil moistures
Residual (mixed with loess and ash)	30	Low timber production High surface erosion hazard and muddiness potential in wet season Dry site
Nonforest	40	Droughty, low vegetative capacity High erosion hazards and muddiness potential from roads Low water holding capacity

Natural and Human Influences

In addition to soils, long-term productivity can be described as the ability of the forest to withstand impacts from both biotic and abiotic influences. Insects, diseases, wildfire, atmospheric deposition, silvicultural treatments, and harvesting practices are primary examples of influences that can have both positive and negative affects on the "health of the forest," and therefore, long-term productivity of the resources therein (See Forest Health, this chapter for a more detailed discussion). It is believed that the presettlement forest was maintained in a relatively healthy condition with frequent natural fire (Hall, 1976; Volland and Dell, 1981). These low intensity fires had a significant affect on soil development, as well as vegetative species composition, distribution and density. The elimination of wildfire, introduction of intensive livestock grazing, and harvest of timber have had a profound effect on the ecological processes throughout the forest (See Fire, this chapter, for a more detailed discussion). Many believe that significant increases in forest pest outbreaks, such as spruce budworm, are a direct result of fire control (Schmidt, 1983). The affects of fire elimination on soils are less understood, but there is some indication that long-term soil productivity may actually be enhanced (on some soil types) as a result of increased organic materials which were historically eliminated by fire (Harvey, Jurgensen, Larsen and Graham, 1987).

Vegetation and Biological Diversity

The vegetation of the Ochoco National Forest and Crooked River National Grassland can be described by using "plant associations" and "vegetation types.": Each plant association indicates the presence of a specific type of environment.

Plant Associations

The vegetation of the Ochoco National Forest consists of forested and nonforested plant associations. These plant associations are distributed according to elevation, soil type, topography, and precipitation. Ecologists use the presence and abundance of indicator plants to classify certain types of environments. This reduces the numerous combinations of vegetation into classes called plant associations.

Forested plant associations are grouped according to climax tree or shrub species (series). The series is then subdivided using shrubs and herbs to form an association classification reflecting both the macroclimate and the microclimate. Trees tend to reflect relatively broad patterns of climate: while shrubs and herbs reflect more complex patterns of microenvironment. Each plant association is recognized by a distinctive combination of overstory and understory plants at maturity. Hall (1973) has identified 44 plant associations for the Blue Mountains in Eastern Oregon and Southeastern Washington. Hopkins and Kovalchik (1983) have identified 16 plant associations for the Crooked River National Grassland. In separate work, Kovalchik (1987) has described the riparian associations found on the Ochoco National Forest and Crooked River National Grassland.

TABLE 3-2
PLANT ASSOCIATIONS

Vegetation Type	Name	Code
Mixed Conifer (206,020 acres)	Ponderosa Pine - Douglas-Fir - Snoberry Oceanspray	CD-S6-11
	Mixed Conifer - Pinegrass, Residual Soil	CW-G1-11
	Mixed Conifer - Pinegrass, Ash Soil	CW-G1-12
	Lodgepole - Pinegrass - Grouse Huckleberry	CL-G2-11
	Lodgepole - Grouse Huckleberry	CL-S4-11
	White Fir - Twinflower - Forb	CW-F3-11
	White Fir - Huckleberry	CW-S2-11
	White Fir - Grouse Huckleberry	CW-S8-11
	Sub-Alpine Fir - Big Huckleberry	CE-S3-11
	Sub-Alpine Fir - Grouse Huckleberry	CE-S4-11
Ponderosa Pine (340,440 acres)	Ponderosa Pine - Douglas-fir - Elk Sedge	CD-G1-11
	Ponderosa Pine - Wheatgrass	CP-G1-11
	Ponderosa Pine - Fescue	CP-G1-12
	Ponderosa Pine - Blue Wildrye	CP-M1-11
	Ponderosa Pine - Bitterbrush - Ross Sedge	CP-S2-21
Low Site Ponderosa Pine (13,240 acres)	Ponderosa Pine - Wheatgrass	CP-G1-11
	Ponderosa Pine - Fescue	CP-G1-12
	Ponderosa Pine - Bitterbrush - Ross Sedge	CP-S2-21
Pine-Juniper-Shrub Transition (116,400 acres)	Ponderosa Pine - Wheatgrass	CP-G1-11
	Ponderosa Pine - Fescue	CP-G1-12
	Ponderosa Pine/Bitterbrush/Idaho Fescue	CP-S2-11
Juniper-Shrub (171,830 acres)	Juniper - Bunchgrass	CJ-G1-11
	Juniper - Stiff Sage Scabland	CJ-S8-11
	Juniper - Low Sagebrush	CJ-S1-11
	Juniper - Big Sagebrush	CJ-S2-11
	Juniper/Gray Rabbitbrush - Big Sagebrush/ Crested Wheatgrass	CJ-S2-91
	Juniper/Gray Rabbitbrush - Big Sagebrush/ Beardless Wheatgrass	CJ-S2-92
	Juniper/Big Sagebrush/Bluebunch Wheatgrass Idaho Fescue, Mound, and Sandberg Bluegrass, Swale	CJ-SB-11
	Juniper/Big Sagebrush/Bluebunch Wheatgrass Idaho Fescue, Flat	CJ-S2-26
	Juniper/Big Sagebrush - Rock Spirea/ Bluebunch Wheatgrass - Arrowleaf Balsamroot, Steep N Canyon	CJ-S2-31
	Juniper/Big Sagebrush - Green Rabbitbrush/ Idaho Fescue - Arrowleaf Balsamroot, Steep N Canyon	CJ-S2-32
	Juniper/Big Sagebrush/Bluebunch Wheatgrass - Sandberg Bluegrass, S Slope	CJ-S2-13
	Juniper/Big Sagebrush/Idaho Fescue - Bluebunch Wheatgrass, N Slope	CJ-S2-12
Shrub-Grassland (9,130 acres)	Low Sagebrush - Bunchgrass	SD-19-11
	Big Sagebrush - Bunchgrass	SD-29-11
	Alpine Sagebrush	SS-49-11
	Bitterbrush - Bunchgrass	SD-39
	Curlleaf - Mountain Mahagony - Grass	SD-49
	Snowberry Shrubland	SM-31

Vegetation Type	Name	Code
Grassland (50,330 acres	Bunchgrass on Shallow Soil, Gentle Slope	GB-49-11
	Bunchgrass on Deep Soil, Gentle Slope	GB-49-12
	Bunchgrass on Shallow Soil, Steep Slope	GB-49-13
	Bunchgrass on Deep Soil, Steep Slope	GB-49-14
	Alpine Sedge	GS-39-11
Meadow (5,520 acres)	Dry Meadow	MD
	Moist Meadow	MM
	Wet Meadow	MW
	Quaking Aspen Meadow	HQ-M1
Scabland (43,970 acres)	Bluegrass Scabland	GB-91-11
	Stiff Sage Scabland	SD-91-11
	Shrub Dominant	SD-B9
	Grass Dominant	GB-B9
	Stiff Sagebrush/Sandberg Bluegrass - Bigseed Lomatium, Scabland	SD-91-31

* Information from District mapping projects, TRI orthophotos, field checks, and Hall's *Plant Communities of the Blue Mountains in Eastern Oregon and Southeastern Washington*, (1973)

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Vegetation Types

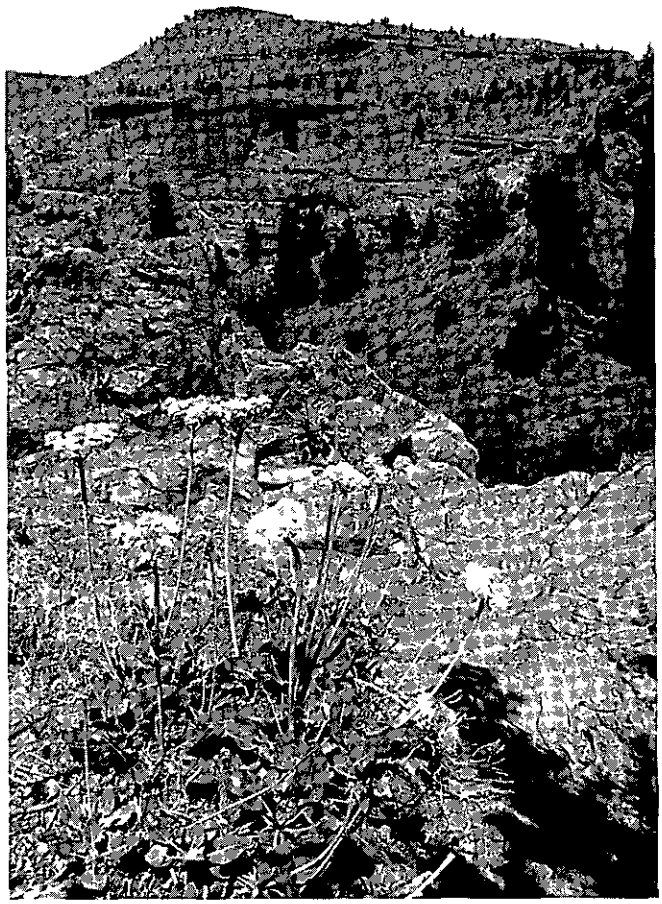
For administrative planning and analysis purposes, the plant associations identified by Hall (1973), and Hopkins and Kovalchik (1983) have been combined into nine vegetation types as follows: mixed conifer, ponderosa pine, low site ponderosa pine, pine-shrub transition, juniper-shrub, shrub-grassland, grassland, meadow, and scabland. The first three are considered forested vegetation types and the last six are nonforested types.

Forested Vegetation Types

The mixed conifer type occurs on portions of the Ochoco National Forest with the most precipitation (25 inches or more) and/or on northern and eastern aspects where evaporative losses from solar radiation are minimal. Approximately 95 percent of the Forest's mixed conifer stands are mature (over 100 years old) and single or multi-story in structure. This type is dominated by stands of ponderosa pine, Douglas-fir, white fir, western larch, and lodgepole pine. Understory vegetation is comprised primarily of pinegrass, elksedge, and heartleaf arnica. Silviculturally, these stands are often treated in a similar manner since it is frequently not feasible to manage the understory due to disease, insect, and physical damage interactions. Treatments most often involve a regeneration cut (clearcut, shelterwood, or some modification of either) and subsequent reforestation, either naturally or artificially.

At mid to lower elevations, the ponderosa pine vegetation types receive less precipitation. Their occurrence is also associated with southern and western aspects. About two-thirds of the ponderosa pine stands are two-storied or multi-storied in structure, and contain small amounts of Douglas-fir. Ground vegetation is comprised of elk sedge, bluebunch wheatgrass, fescue, and bitterbrush. These stands have varying amounts of large old growth ponderosa pine (overstory trees) with younger trees of pine or other species below (understory). The understory is also variable in terms of the number and size of the trees, but can usually be managed silviculturally after the overstory removal without additional reforestation.

Low site ponderosa pine types generally occupy a transition area between the predominant, higher elevation pine type and nonforested areas. This type is dominated by ponderosa pine and juniper. Ground vegetation is comprised of fescue, bluebunch wheatgrass, bitterbrush, Sandberg bluegrass, and mountain mahogany. Individual tree harvest occurs on these types, when sufficient advance reproduction of commercial species already exists.



Nonforested Vegetation Types

Below the forested types, tree-shrub (pine-shrub transition and juniper-shrub) vegetative types occur. Precipitation and evaporative losses are limiting to most trees on these sites, except juniper and an occasional ponderosa pine. The grassland vegetation type receives the least precipitation of the vegetation types discussed, less than 10 inches annually, and generally occupies the lowest elevations. Dry, moist, or wet meadows occur locally, depending on the availability of water throughout the summer and fall. Scablands have relatively less vegetation cover than the other vegetation types due to their rocky and shallow soils. A discussion on the major plant species that occur in each of these vegetation types follows.

Pine-Shrub Transition - This type is dominated by juniper and ponderosa pine. Understory vegetation includes sagebrush, bitterbrush, and wheatgrass.

Juniper-Shrub - This type is dominated by juniper and sagebrush. Understory vegetation consists of wheatgrass and fescue.

Shrub-Grassland - This type is dominated by sagebrush, bitterbrush and rabbitbrush. Herbaceous vegetation consists of fescues and wheatgrass.

Grassland - This type is dominated by bunchgrass, wheatgrass, and sagebrush. Juniper may also occur in significant amounts on this vegetative type.

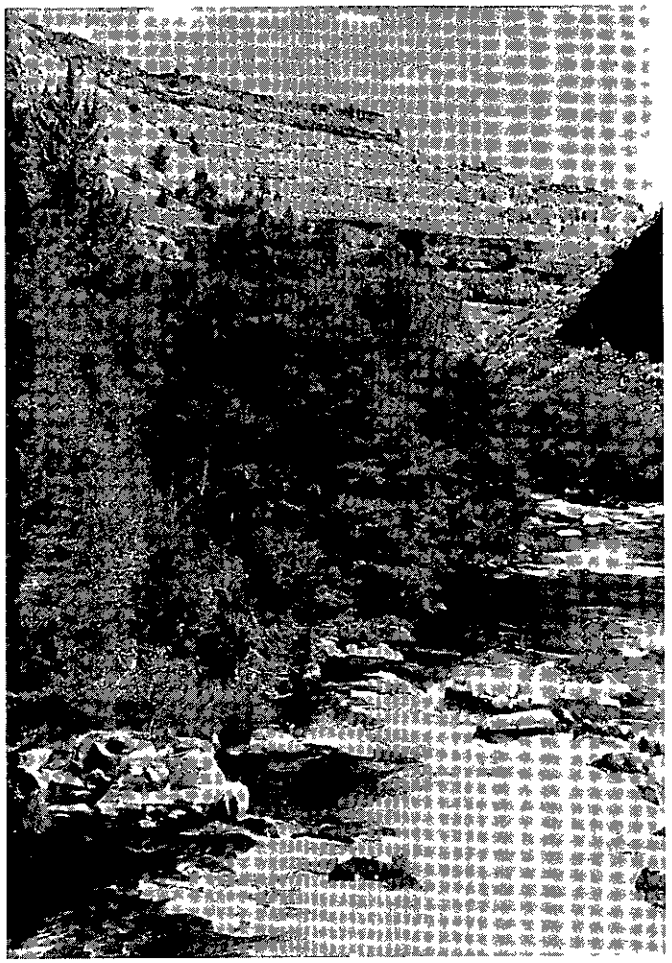
Meadow - This type is dominated by tufted hairgrass, oval-head sedge, and Nebraska sedge. The ratio of sedges to grasses increases in moist meadows.

Scabland - This type is dominated by bluegrass, oatgrass, and rigid sage.

Riparian Areas

Riparian areas are adjacent to water. They are where plants occur that are dependent on a perpetual source of water, and that are a significant component of the diverse ecosystem. Riparian sites include stream banks, active channel shelves (e. g. gravel bars), active flood plains, and overflow channels (Kovalchik, 1987).

The Ochoco National Forest has approximately 19,000 acres of riparian areas that are associated with about 800 miles of streams. The Crooked River National Grassland has about 2,090 acres of riparian acres along approximately 30 miles of streams. These riparian areas amount to 2 percent of the land base.



Abundance and Distribution of Different Plant Successional Stages

Forested Areas

The abundance and distribution of various timbered successional stages has possibly the greatest affect on the overall biological diversity of plants and animals on the Ochoco National Forest. A "managed" forest, represented by a wide variety and distribution of successional stages, is likely to maintain more resistance to insect and disease outbreaks, wildfire, and other potentially destructive forces. Variety also increases both the vertical and horizontal diversity, which increases habitat for wildlife species. Historically, diversity was much lower because large acreages of the Ochoco National Forest were maintained as large open ponderosa pine stands by frequent, low intensity fires.

Table 3-3 shows existing acres of different forested successional stages (Stages 1-6) on the Ochoco National Forest.

TABLE 3-3

	Stage 1 & Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
AGE –>	Grass-forb & Shrub seedling (0-10)	Pole-sapling (11-39)	Young (40-79)	Mature (80-159)	Old Growth (160+)
Total = 571 M Acres	9	170	159	139	94

Old Growth

Old growth (Stage 6 vegetation) has been recently inventoried for the ponderosa pine and mixed conifers vegetation types. This successional stage is of importance because of its diverse stand structure and because of its ability to provide cavity nesting habitat. A total of 93,800 acres have been identified and mapped. Of these, 30,300 lie within Wilderness and Research Natural Areas.

Old growth in the juniper-shrub type has yet to be mapped; however, 740 acres have been reserved on the Crooked River National Grassland.

For a further discussion of the old growth resource, refer to the Old Growth section of this chapter.

Nonforested Areas

Nonforested plant associations on the Forest and Grassland include: 1) dry and wet meadows which are found throughout the Forest, generally at higher elevations; 2) sagebrush/bunchgrass and sagebrush/bunchgrass/juniper sites which are found at lower elevations of the Forest, and over much of the Grassland; and 3) the various scabland community types which are found throughout the Forest, except on north aspects.

Successionally, the nonforested types are not changing since the majority are at or near climax. A shift, however, has been noted from a historical fire climax to the more recent nonfire climax type. Trees are encroaching on many meadows and juniper is invading many of the lower elevation sites due to lack of fire.

Distribution of Forested and Nonforested Vegetation as an Element of Diversity and Habitat

Forested and nonforested areas are distributed in a random, mosaic fashion across the Ochoco National Forest Compared to the surrounding "high desert," the Forest offers a greater diversity of habitats, and this is not duplicated in the immediate central Oregon area. The Forest is relatively isolated from its neighboring national forests, and adjacent forest lands of other ownership are not extensive.

It is this great variety of vegetative diversity that provides habitat for over 378 terrestrial wildlife species (See Wildlife and Fish Elements and Biological Diversity). Food, cover, and water (essential wildlife habitat) exist across the Forest and Grassland in quantities capable of supporting large numbers of both game and nongame species. Riparian areas and their associated water resource are the most critical wildlife habitats, supporting possibly as much as 75% of all terrestrial wildlife species on the Forest and Grassland. Perennial streams usually support trout and other species of fish. The riparian vegetation is of critical importance for escape cover, stream shade, and streambank stability as it maintains water quality and aquatic habitat. Riparian areas can also serve as forested connectors (connective habitat) between original or primary habitats for many species. Pileated woodpeckers, a management indicator species, are likely to use these travel lanes to move between primary reproductive and feeding areas (Bull, 1989).

Figure 3-2

CONNECTIVE HABITAT

PRINEVILLE

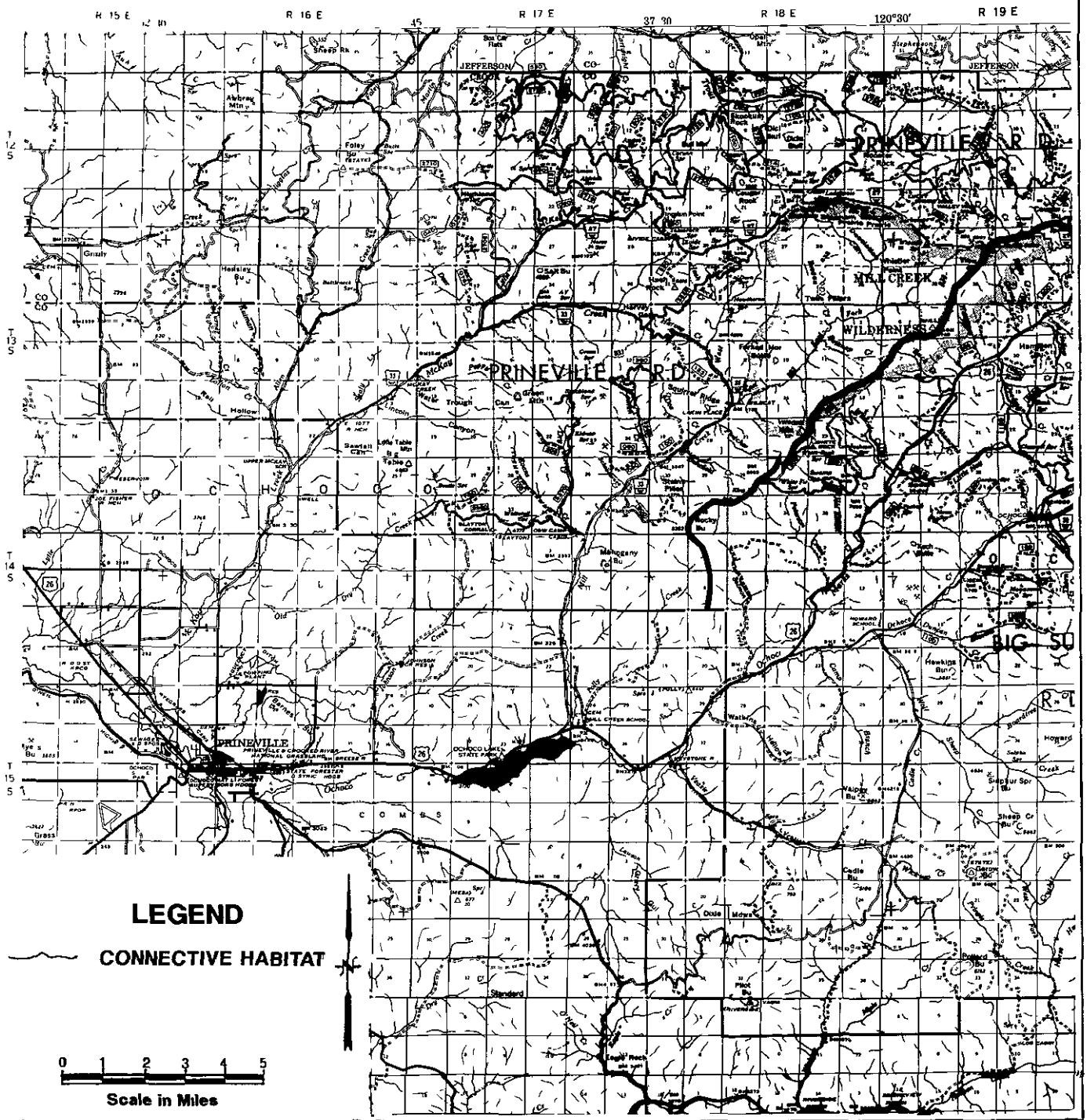


Figure 3-3

CONNECTIVE HABITAT

PRINEVILLE (MAURYS)

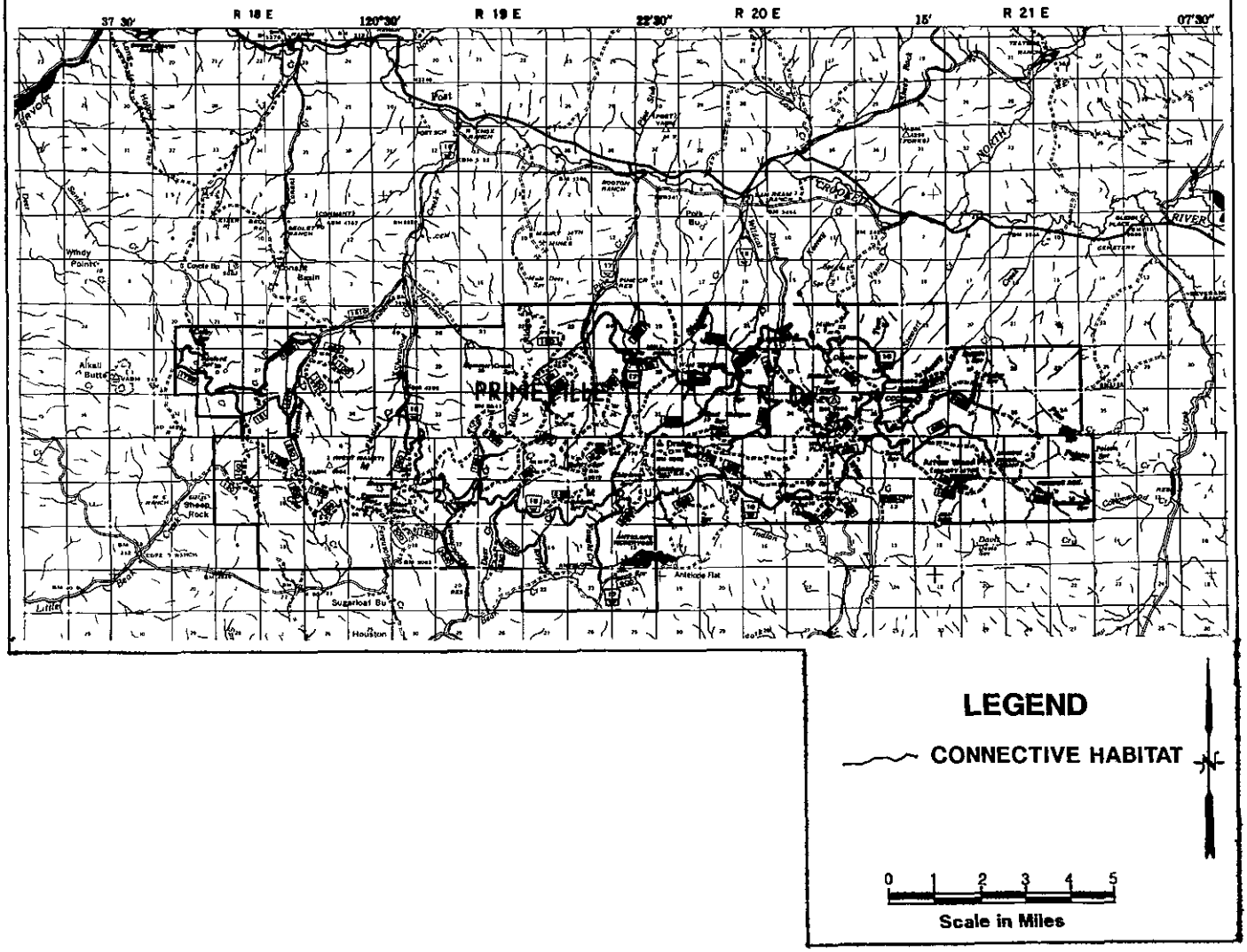


Figure 3-4

CONNECTIVE HABITAT

BIG SUMMIT

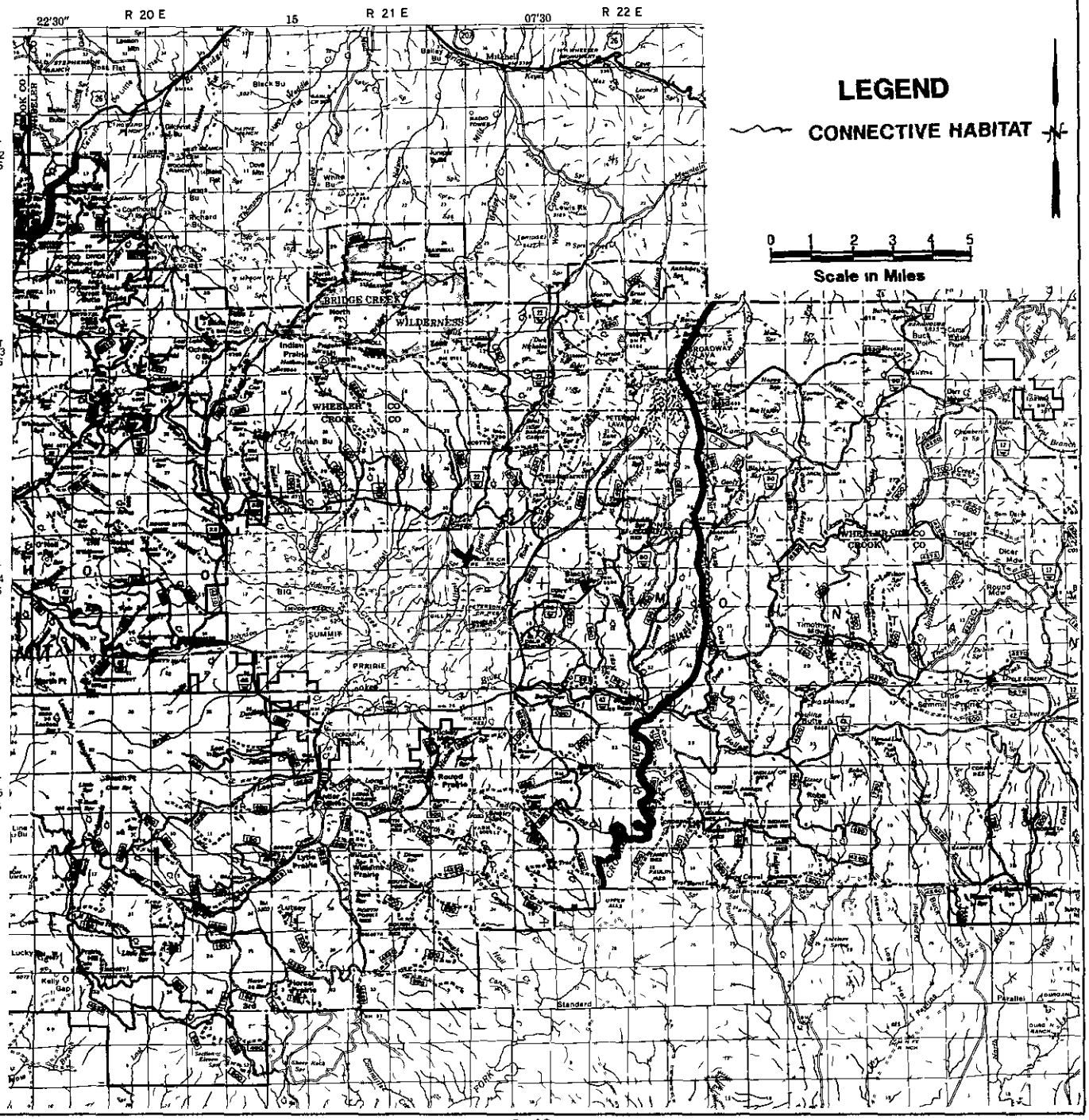


Figure 3-5

CONNECTIVE HABITAT

PAULINA

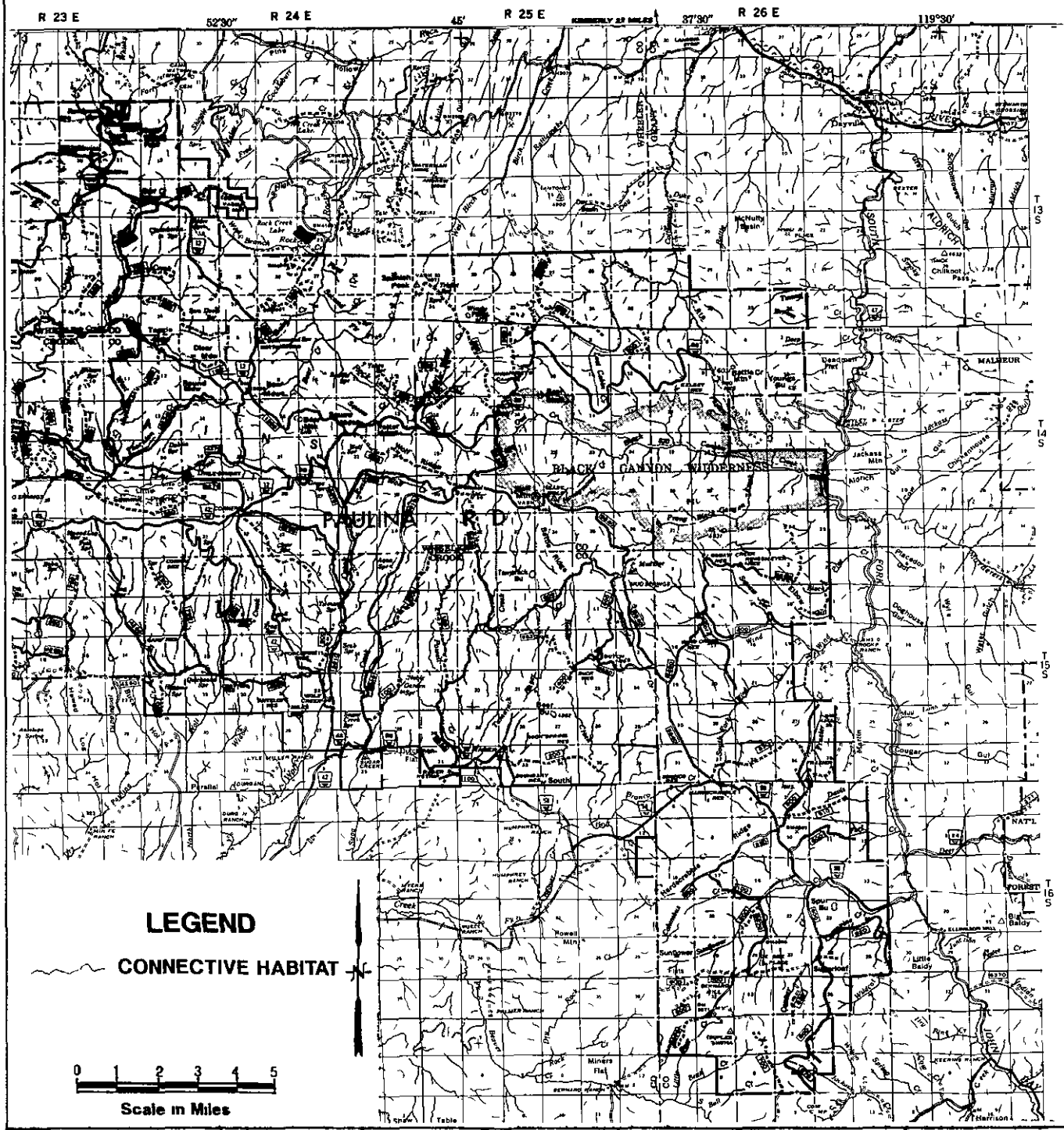
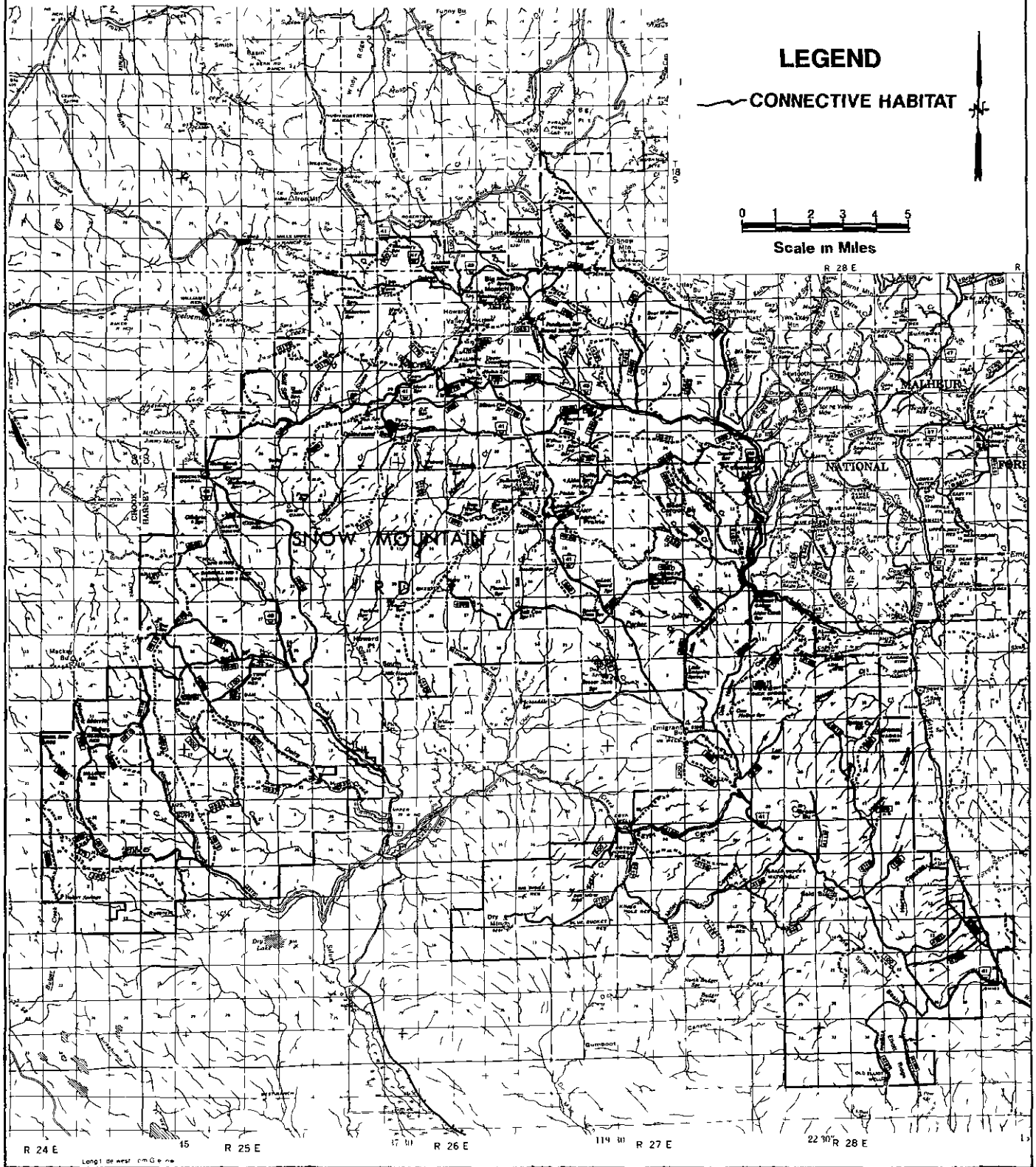


Figure 3-6

CONNECTIVE HABITAT

SNOW MOUNTAIN



Undisturbed Ecosystems and the Role of RNA's

Ecosystems that are substantially undisturbed represent rare conditions on the Ochoco National Forest and Crooked River National Grassland. Preservation of this element of biological diversity is one of the objectives of the Research Natural Area program.

Research Natural Areas (RNA's) are tracts of land where specific natural features are preserved and natural processes are allowed to occur for research, education, and conservation purposes. The primary reasons for preserving these tracts are to provide:

1. Baseline areas against which the effects of human activities in similar environments can be measured;
2. Sites for study of natural processes in undisturbed ecosystems, and
3. Gene pool preserves (gene pool conservation) for plant and animal species, particularly rare and endangered types.

RNA's offer biologists and other natural resource scientists opportunities to study biota, environments, and ecological processes with a minimum of disturbance to installed studies.

The Ochoco National Forest has one established RNA, the Ochoco Divide Research Natural Area (2,035 acres) on the Big Summit Ranger District. The Crooked River National Grassland does not have any established RNA's.

Central and eastern Oregon currently lack adequate representation of natural features in the RNA system. In a cooperative effort with other Federal agencies, as supported by the Federal Committee on Research Natural Areas, the Ochoco National Forest and Crooked River National Grassland were reviewed to determine if areas existed that met RNA needs as identified in "Research Natural Area Needs in the Pacific Northwest" (Dryness et al., 1975). Coordination with the Bureau of Land Management by Forest Service ecologists led to the identification and proposal of five additional RNA's on the Ochoco National Forest and Crooked River National Grassland.

TABLE 3-4
PROPOSED RESEARCH NATURAL AREAS

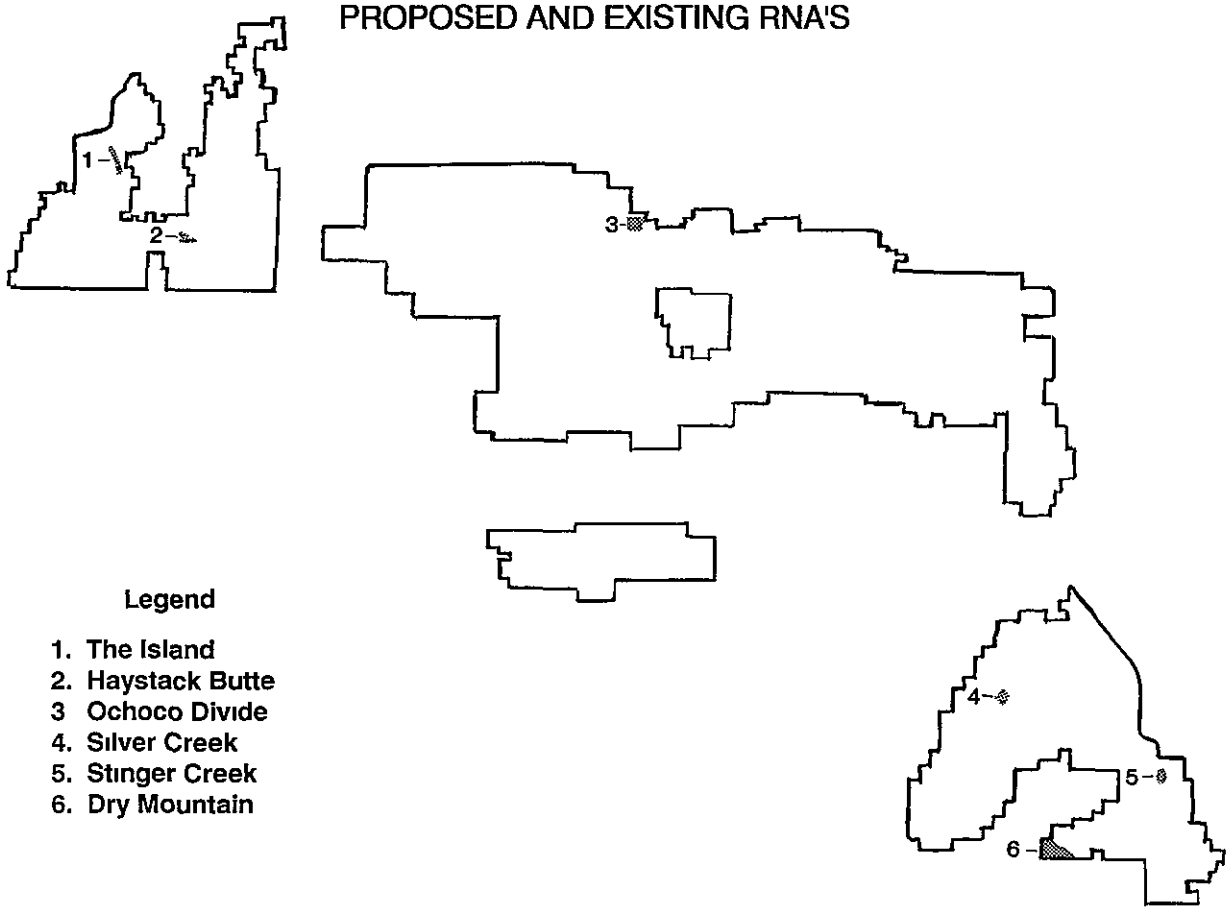
		Acreage		
Proposed Area	Location	National Forest System Lands	Total (All Ownership)	Major Characteristics
Dry Mountain	Snow Mtn Ranger District	1,187	1,187	Ponderosa pine/pinegrass ecosystems
Silver Creek	Snow Mtn Ranger District	844	844	Riparian setting and associated uplands
Stinger Creek	Snow Mtn Ranger District	453	453	Ponderosa pine/bitterbrush and scabland ecosystems
The Island	Crooked River National Grassland	39	199	Juniper/shrub/steppe ecosystems (discontinuous)
Haystack Butte	Crooked River National Grassland Option A Option B	 100 58	 146 84	Juniper/shrub/steppe ecosystems (continuous)

A comprehensive Establishment Report must be prepared for each RNA proposed on National Forest system lands. Prior to the establishment of a proposed RNA, the Establishment Report is submitted to the Chief of the Forest Service for approval.

A complete description of the existing and proposed research natural areas can be found in Appendix E. Figure 3-7 shows the approximate locations of the established and proposed RNA's. Table 3-4 displays the acreage, location: and major characteristics of the proposed RNA's.

A proposed RNA on the Crooked River National Grassland called "The Island" has also been identified as a potential National Natural Landmark by the National Park Service. National Natural Landmarks are areas representing the best examples of the ecological and geological features composing our Nation's natural history. The National Park Service has identified The Island area as 1) the largest and most pristine example of western juniper/big sagebrush/bluebunch wheatgrass community in the Columbia Plateau, and 2) the best example of the pumice western juniper steppe community.

Figure 3-7
PROPOSED AND EXISTING RNA'S



Wildlife and Fish Elements and Biological Diversity

The abundance and distribution of animal species is a key element of biological diversity. Typically, animals are dependent upon or frequently use certain vegetation types or successional stages that have been previously discussed. Consequently, managing for the maintenance of diversity of vegetation ensures a diversity of wildlife habitats and continued existence of healthy populations. This contention will be tested through the monitoring of management indicator species.

Management Indicator Species

To help determine the effects of management activities on wildlife and fish habitat, several species and groups of species were chosen as management indicators. The habitat requirements of management indicator species are assumed to be similar for other wildlife and fish species. If a selected species and its habitat are influenced significantly by management activities, like effects can be expected on other fish and wildlife species with similar habitat requirements. The indicator species were selected in conjunction with the Oregon Department of Fish and Wildlife (ODFW). The selected species are listed in Table 3-5 along with their respective types of habitat.

TABLE 3-5
MANAGEMENT INDICATOR SPECIES AND RESPECTIVE HABITAT

Indicator Species	Habitat provided by the Forest and Grassland
Brook and Rainbow Trout	Riparian
Pileated Woodpecker	Old Growth
Primary Cavity Excavators 1/	Snag
Common Flicker	Old Growth Juniper
Rocky Mountain Elk	Big Game

1/ Wildlife species that excavate cavities in snags

Brook and Rainbow Trout were picked as a indicator group. The Salmonids have a broad distribution across the Forest and are of economic importance resulting from commercial and recreational harvest. The group generally has similar habitat requirements which are narrow enough to ensure viability of most other game fish. The habitat requirements make the group a good indicator of **riparian habitat** and aquatic habitat condition for the Ochoco National Forest and Crooked River National Grassland.

Pileated Woodpeckers serve as an indicator for other species that require large snags, large amounts of down-dead wood, and large trees with defect. The pileated woodpecker represents the presence of favorable habitat for species that require mature forest and **old growth habitat.** It may also indicate the presence of favorable habitat for secondary cavity nesters, such as Northern flying squirrel, pygmy owl, saw whet owl, and flammulated owl.

We have incomplete knowledge of current pileated woodpecker populations and habitat requirements, but 93,800 acres on the Forest are currently suitable old growth habitat. The majority of existing old growth habitat occurs as mixed conifer stands on the north part of the Ochoco National Forest. This results in an uneven distribution of old growth across the Forest Current direction calls for maintenance of 36,975 acres of old growth over time. Currently, 28,000 acres are dedicated for pileated habitat, while the remainder is recruited through long rotation management.

Primary Cavity Excavators and the Common Flicker were selected to represent the species that utilize snags and **old growth juniper habitat** respectively. The common flicker is probably the only primary cavity excavator that is capable of creating cavities in juniper (Thomas, 1979). The Forest and Grassland do not have population estimates for primary cavity excavators or flickers at this time.

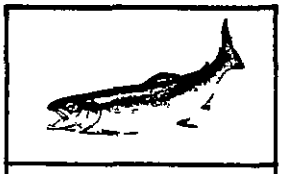
Primary Cavity Excavators were selected to represent the species that require **snag** habitat that is often reduced by forest management activities. Also, this group of species has high public interest and serve a predators of forest insect pests. The primary cavity nesters serve as ecological indicators for a large number of species and for secondary cavity users, like swallows, blue birds and bats.

Present snag densities are relatively high (80-100 percent of potential populations) in most mixed conifer stands. However, due to past entries for salvage logging and firewood gathering, snag densities are relatively low in ponderosa pine stands (20-60 percent of potential populations). Current direction is to manage for 40 percent of potential populations as stands are entered for timber harvest. Only lodgepole pine snags are currently available for firewood gathering.

Rocky Mountain Elk were selected as an indicator species to reveal changes in **big game habitat**. The elk was selected because of public interest and the recreational value of big game.

Figure 3-8

MANAGEMENT INDICATOR SPECIES AND RESPECTIVE HABITAT

Indicator Species		Habitat Provided by the Forest and Grassland
Brook Trout/Rainbow Trout		Riparian habitat
Pileated Woodpecker		Old Growth habitat
Primary Cavity Excavators[1]		Snag habitat
Common Flicker		Old Growth Juniper habitat
Rocky Mountain Elk		Big Game habitat

[1] Wildlife species that excavate cavities in snags

Cultural Resources

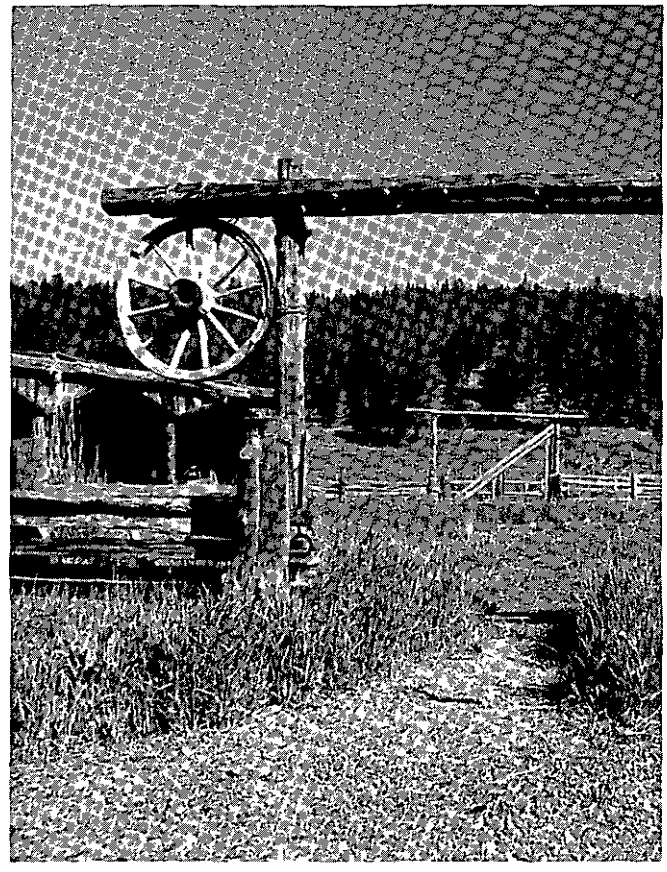
The cultural resources of the Ochoco National Forest and Crooked River National Grassland include a variety of prehistoric and historic sites which represent perhaps 10,000 years of human use and settlement. Presently, over 1,700 cultural resource sites have been documented on the Ochoco National Forest and Crooked River National Grassland. Approximately 1,000 of these sites are prehistoric, providing evidence of the occupation and land use patterns of Native Americans. The remaining 700 sites document Euro-American activities over the past 150 years.

Prehistory

Most of the prehistoric sites on the Ochoco National Forest and Crooked River National Grassland are called lithic scatters, i.e. they consist of chipped stone tools and the by-products of tool manufacture. Native Americans used a wide variety of materials in adapting to their environment, but artifacts fashioned from wood, natural fibers, bone, and hide usually decay when subjected to harsh weather, moisture, and/or acidic soil conditions. Chipped stone tools and flakes are often all that remain at a site after centuries of occupation. As a group, the prehistoric lithic scatters have been determined eligible for the National Register of Historic Places.

History

Historic sites on the Ochoco National Forest and Crooked River National Grassland provide direct evidence of how settlers lived and how their actions affected the land. For instance, remnants of the Paulina Deadline (circa 1900), which marked the boundary between lands allocated for cattle grazing and those allocated for sheep grazing, are still present on parts of the Ochoco National Forest. While the conflict between cattle ranchers and sheep herders is widely known, such material evidence of this conflict is rare. Similarly, early mining activity on the Big Summit Ranger District is documented by abandoned mines at Scissorsville and at the Amity, Blue Ridge, and Independent mines. The Crooked River National Grassland contains vestiges of extensive homesteading during the early twentieth century. While successful homesteads have generally remained in private ownership, these latter public lands contain evidence of the more typical and often anonymous homesteaders.



A few historic sites have been listed, or have been determined eligible for the National Register of Historic Places. These sites are representative of the early administration of the Forest Service, and include the original Allison Ranger Station on the Snow Mountain Ranger District (circa, 1910), and the depression-era compounds built by the Civilian Conservation Corps (Lamonta, Rager, Big Summit, and Allison). These historic sites will be maintained with the goal of retaining their historic values.

Inventory Status

The Cultural Resource Overview for the Ochoco National Forest and Crooked River National Grassland was completed in 1987 under contract with Heritage Research Associates (Minor, Beckham, Toepel, and Greenspan, 1987). This document summarizes data for all historic and prehistoric sites; a synopsis of the cultural resource inventory is provided in the Overview (Ibid.: pp. 193-199). This document is used to provide contexts for the assessment of cultural resource significance, assist in cultural interpretation, develop a Cultural Resource Inventory Design, and provide basic background and reference material.

The Ochoco National Forest and Crooked River National Grassland are still in the process of gathering basic information about the location and nature of their cultural resources. By October 1, 1988, approximately 30 percent of the Ochoco National Forest the Crooked River National Grassland had been inventoried at varying degrees of intensity. The Ochoco National Forest and Crooked River National Grassland will not attain a complete inventory of its acreage by 1990, as directed by Executive Order 11593. Given recent levels of support and activity (5 year average = 26,000 acres/year) it would take approximately 25 years to inventory the remaining acreage. The current inventory of cultural resource sites is summarized in Table 3-6.

TABLE 3-6
CULTURAL SITE INVENTORY
(as of 1988)

Cultural Resource	Sites	Acres
Historic	715	1,020
Prehistoric	1,350	5,130
Total	2,065	6,150

Source Ochoco Cultural Resource Management Files

The Interim Cultural Resource Inventory Design is currently under review by the Oregon State Historic Preservation Office. This design, as required by the 1987 Lithic Scatter Programmatic Memorandum of Agreement, serves to incorporate current inventory data and regional research questions regarding area prehistory and history with a comprehensive means for locating cultural resources in broad areas proposed for treatment under the schedule of proposed land and resource management activities.

The design provides guidance in the development of Ranger District-project survey designs. It outlines two basic types of inventory; initial and secondary (re-survey). Initial surveys will be conducted in areas previously unsurveyed. Secondary surveys are conducted in areas inventoried where previous surveys were not adequate, where ground conditions have changed since initial entry, and where information on site frequency indicates new levels of cultural resource predictability.

The design keys the predictability of cultural resource site location to environmental variables. It recognizes three levels of site frequency: high, normal, and low. These variables are then employed to predict site frequency and selectively survey large, topographically diverse project areas such as timber sales.

A complete inventory (100% survey) is undertaken for known, reported and suspected cultural resource sites and areas. Pedestrian transect surveys (transect interval less than 50 M) are conducted in areas identified as containing one or more variables indicating a predicted high or normal site frequency. On project areas indicating low site frequency, a 20% sample will be obtained via additional pedestrian transect surveys through random and convenience sampling. For projects less than 100 acres (e.g. spring developments, recreation sites, pipelines and road corridors) a complete 100% survey will be undertaken.

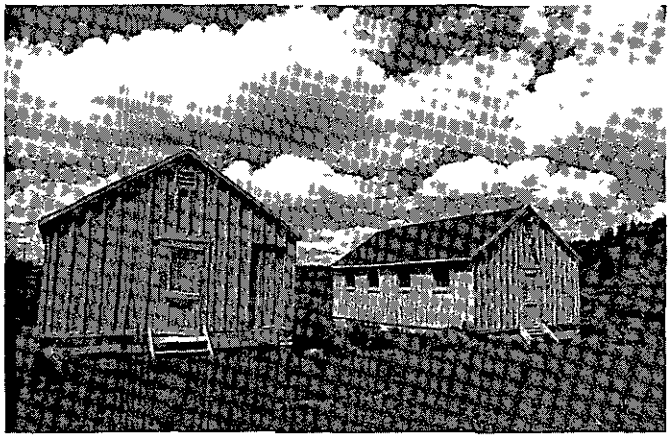
The Ochoco National Forest and Crooked River National Grassland is investigating ways to increase the reliability of its inventory efforts. The current inventory design was created as a fluid plan to be constantly improved upon during its implementation, and as the result of new data and interpretations of existing data.

Facilities

The Ochoco National Forest and Crooked River National Grassland have 103 buildings, 36 potable water sources and nine dams.

The buildings are located at five administrative sites and six fire lookout sites. The buildings include offices, residences, crew quarters, shops, warehouses, storage buildings, lookouts, and tree coolers. Several buildings built before 1937 have National historic significance. Maintenance has been adequate to keep the buildings serviceable and structurally sound. Changes in forest management and methods of work have caused some structures to be extensively remodeled to retain their usefulness.

Efficient management of the Forest will continue to require administrative sites based on resource needs, budget, and personnel needs. A Facilities Master Plan for buildings will be prepared as part of the implementation of the Forest Plan. It will guide the acquisition, continued use, and disposal of forest buildings.



The water systems serve administrative sites, developed and dispersed recreation sites. Most of the recreation water systems need to be reconstructed to meet current State standards for construction. This work is scheduled to be completed in the next three years.

There are nine dams on the Forest over 10 feet in height. Four of the dams are Forest owned and operated, four are operated under special use permits, and one by a public utility company. The Forest-operated dams store water for irrigation. The Forest also has dozens of small dams which impound seasonal water for wildlife and livestock.

The Forest plans to improve existing dams where appropriate. No new dams are foreseen at this time.

Fire

Natural Fire and Ecological Effects

Ponderosa pine types have experienced a natural fire frequency of 5 to 15 years (Hall, 1976; Volland and Dell, 1981). Fires burning in these stands can be of low intensity due to light fuel accumulations maintained by frequent underburning. This vegetative type covers the largest portion of the Ochoco National Forest. Ponderosa pine's thick bark, high crown, and specialized water conducting system make it well adapted to resist damage by fire (Hall, 1976). Fire prepares mineral seed beds for seedling establishment, thins reproduction, prunes lower tree branches, stimulates grass and forb growth, maintains open park-like stands (Hall, 1976; Volland and Dell, 1981), and recycles nutrients from dead organic material.

The natural fire frequency in the mixed conifer type is thought to be 25 to 70 years (Martin, 1982). This forest type exists in moist drainage bottoms and on north aspects, which accounts for a longer fire frequency. Tree species common to this timber type are

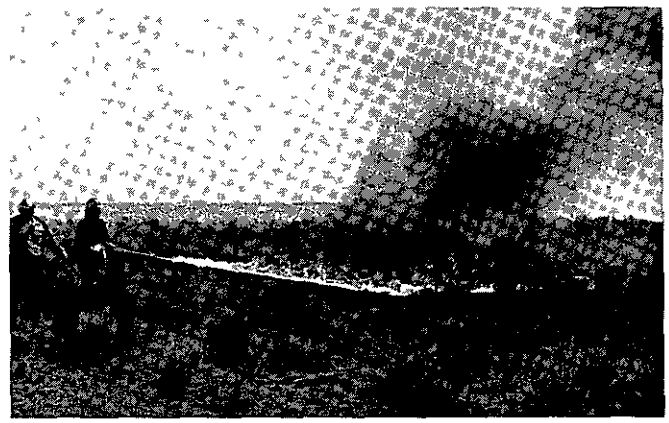
Douglas-fir, ponderosa pine, white fir, western larch, and lodgepole pine. Moderate to high-intensity surface fires, with occasional torching or crowning of trees, occurred in these stands. Heavier fuel accumulations in this type account for the more intense fires. Low limbs and waxy, resinous needles in white fir and Douglas-fir aid torching and crowning. As a result, these species are selectively decreased in stands so that a higher frequency of ponderosa pine and western larch remain. Vertical continuity of fuels is minimized and canopy closure is inhibited. Fire reduces residue loading and exposes mineral soil seedbeds.

A fire frequency of one to ten years is thought to be normal for grassland ecosystems (Martin, 1982; Volland and Dell, 1981). These fires spread quickly and are of low intensity. They frequently cover vast acreages. Growth and vigor of many native grasses, forbs, and brush are stimulated by fire. Frequently occurring natural fires of the past retarded expansion of most brush species and western juniper, thus maintaining a higher component of grasses and forbs in these ecosystems than is found today.

Due to fire suppression and exclusion policies of the past 80 years, the natural ecological cycles involving nutrients, energy, and vegetation dynamics have been altered. Timber harvests have somewhat replaced fire's ecological role through removal and disposal of woody fuels. Grazing also changed vegetation types by removing fine fuels such as grasses, forbs, and succulent brush species. However, neither timber harvest nor grazing duplicates past fire effects. As a result, formerly open pine stands are being replaced by a mosaic of closed canopy, multistoried stands that cover large areas of the Ochoco National Forest. These stands are highly flamable and are more susceptible to destruction by wildfire than the natural fire-maintained open stands that existed previously (Hall, 1976; Volland and Dell, 1981).

Wildfire

Wildfires are common occurrences on the Ochoco National Forest and Crooked River National Grassland during the dry season. There are an average of 108 wildfire starts per year; 80 percent of these are caused by lightning. Abandoned campfires make up 60 percent of the human-caused fires. Risk from human-caused ignitions is beginning to increase as recreation and hunting use increases. The average area burned by wildfire under current suppression management is 750 acres per year.



Prescribed Fire

Up until the late 1970's, fire suppression policies increased the risk of a damaging wildfire. Since then an understanding of the role of fire in ecosystems has caused a return of fire to forest management. The use of prescribed fire on the Ochoco National Forest and Crooked River National Grassland reduces the risk of severe wildfire in treated areas. Approximately 20,000 acres of timber harvest each year requires a variety of residue treatments, including prescribed burning. Prescribed burns for other resource management and natural hazard reduction are conducted on several thousand acres each decade. Prescribed fires are often planned to emulate natural fire frequencies.

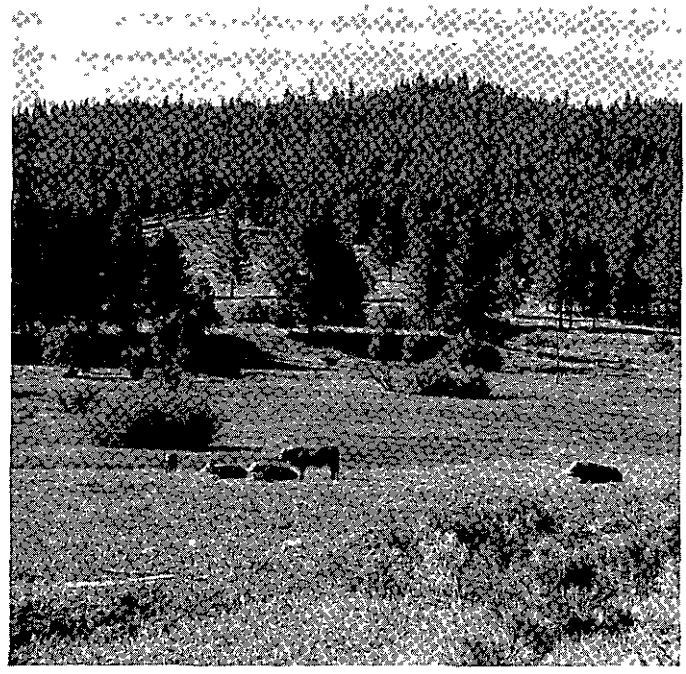
Forage

Much of the forage resource consists of native grasses that grow in a variety of plant communities ranging from grassland to juniper/shrublands. In addition, forage is made available through timber harvest. Dense canopies of trees intercept sufficient light to inhibit forage development on the forest floor. Timber harvest opens up the canopy creating an increase in forage production. Within plantations, the grass can become a problem by reducing seedling survival and inhibiting growth. The forage is utilized by deer and elk for food, however, the major use is for livestock grazing.

Current Status of Livestock Use

The Forest and Grassland supply forage for approximately 14,000 cattle and 3,500 sheep annually. This forage provides summer grazing for livestock belonging to 105 permittees throughout the five surrounding counties. The carrying capacity for range allotments is based on forage production and the forage requirements for livestock. The unit of measure is an animal unit month (AUM), which equals 800 pounds of utilizable forage. Forage requirements for a mature cow with a nursing calf for one month is approximately 1.3 AUM's. Approximately 75,000 AUM's are permitted annually.

Cattle numbers permitted on the Forest and Grassland have not varied significantly over the past decade; however, there has been a conversion from sheep to cattle. This conversion has occurred during the past twenty years. This can be attributed to economics, predator problems, and to a diminishing supply of herders. Most ranching operations throughout the area remain traditional cow-calf operations where the calves are sold each fall.



Grazing Allotments

The Forest and Grassland have a combined total of 90 grazing allotments. Most allotments are subdivided by fences into two or more "pastures." These pastures are incorporated into grazing systems that rotate livestock use on a scheduled basis. A few remaining allotments that are small, isolated, and usually with mixed ownership, do not have fenced subdivisions. These are scheduled for grazing during a specific season.

Many range allotments have forage in upland areas that receive only light use or no use due to a lack of water or low level of management. Allotment plans are being updated to effectively use this upland forage through herding, fencing, and water developments. The goal is to graze this upland forage and to reduce the use where livestock have concentrated in the past, such as riparian areas. More intensive management is also being used to control use of forage in riparian areas. Any long-term change in numbers or season of use is subject to the requirements of an updated allotment plan.

Vegetation condition data for the Forest and Grassland is mostly outdated. Due to restricted budgets, very little vegetation analysis has been done in the last twenty years. Recent allotment management plans have been prepared using the old data which has been field verified and updated. No data is available that accurately reflects condition classes over the entire Forest and Grassland. Best professional judgement indicates the majority of the uplands are one condition class better than 20 years ago. Some riparian areas have improved, and others have remained degraded. New plant association guides for vegetation analysis are to be published for the Ochoco National Forest in 1989.

Demand

The ability of local ranchers to utilize Forest and Grassland forage during the summer months, while producing several crops of hay on the base ranch for winter use, is economically essential to many ranches. Allotments have been fully occupied for many years. When an allotment becomes available it is quickly filled. This indicates the continuing high demand for forage available on the National Forest and Grassland.

Forest Health

Historically, fire has played a major role in determining the kind of vegetation that occupied the lands of the Ochoco National Forest and the Crooked River National Grassland. Natural fire was responsible for limiting the accumulation of forest residues, eliminating overly dense and stagnant pockets of ponderosa pine reproduction, and retarding succession to more tolerant conifers such as white fir and Douglas-fir.

With the exclusion of fire, the vegetation has substantially changed and the stability of the vegetation systems has been significantly reduced. Because of the increase in fuel loading, the probability of a high intensity wildfire that can damage overstory trees has increased. This effect is currently being mitigated through the Forest's prescribed burning program. Overly dense thickets, which are predisposed to insect attack because of their low vigor, are being addressed through the prescribed burning and thinning programs. The tolerant conifers which are increasing in abundance on the cooler and moister sites, are more susceptible to insect outbreak and root pathogens as well. Consequently, the Forest's vegetation is more at risk from insect and disease than it was in presettlement times.

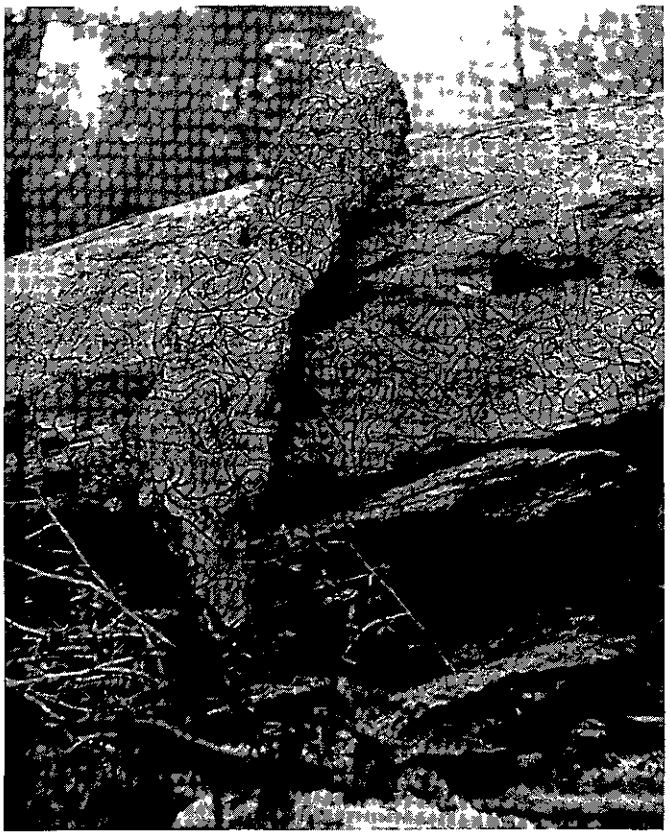
Major insect epidemics occur periodically on the Ochoco National Forest. In the 1950's, a major outbreak of Douglas-fir tussock moth (a defoliator of white fir and Douglas-fir) occurred. This outbreak was controlled with a massive spray program. In the mid 1970's, even-aged lodgepole pine stands were maturing and became susceptible to mountain pine beetle attacks. Most of these stands have suffered severe mortality (90% or more of the trees killed). An outbreak of western spruce budworm, a defoliator, occurred in the early 1980's. This outbreak is still occurring and has affected almost every mixed conifer stand in the Ochoco National Forest. Spraying was considered in an environmental analysis in 1983 and 1984, but no treatment was attempted except on a small research plot in 1984.

Insect and disease losses are principally addressed through silvicultural treatments. Harvesting and thinning techniques are selected to control dwarf mistletoe, mountain pine beetle, Western spruce budworm, Western pine beetle, heart rot, and root rots. Proper timing of slash treatment and thinning operations is used to control the pine engraver beetle.

The major threats to forest health on the Ochoco National Forest and the Crooked River National Grassland can be divided into the following five categories: bark beetles, defoliators, dwarf mistletoe, root diseases and stem decays, and animals. Each of these categories is discussed below.

Bark Beetles

Insects that lay eggs beneath the bark of host trees are referred to as bark beetles. Larvae emerging from the eggs tunnel and feed on the tree's cambial layer (Doliner 1984). These include mountain pine beetle, western pine beetle, pine engravers (Ips), and fir engravers. These are a major problem in pine types. The damage from these insects increases in over-stocked or over-mature stands (Mitchel, et al, 1983).



Defoliators

Insects that consume tree foliage are referred to as defoliators. These include western spruce budworm and Douglas-fir tussock moth. These are a major concern in mixed conifer stands, and damage from these insects occurs primarily in multi-aged or over-mature stands. These insects can also cause damage or destruction to cones and seeds (Wickman, et al, 1981, Gara 1981, Schmidt 1983).

Dwarf Mistletoe

This is a parasitic flowering plant which has no apparent leaves, and occurs only on above-ground parts of conifers (Doliner 1984). Damage to the host includes growth reduction and lowered wood quality. Mistletoe may kill or predispose the host to attack from other pests (Graham 1967). Dwarf mistletoe damage on ponderosa pine and Douglas-fir is a major concern on the Ochoco National Forest. Western larch may also be seriously infected in more localized areas. The amount of stand infestation and subsequent growth loss is frequently increased by partial harvest and long rotations.

Root Diseases and Stem Decays

These diseases are caused by a variety of fungi that infect the host tree through root contact or past injury. Damage from root rots and stem decay include growth loss, wood decay, and tree mortality. Rots and decays also predispose the infected tree to insect attack. The most common root rots are laminated, Fomes annosus, and Armillaria root rot. The most common stem decay is caused by Indian paint fungus. Mortality and usable wood loss can occur. Management activities that increase losses are partial cutting, which maintains susceptible species on the site, and logging.

Animals

Both wild and domesticated animals can cause damage to trees Damage to small trees from wild animals is primarily caused by big game (elk and deer) and pocket gophers. Damage to large trees from wild animals is primarily caused by porcupines. Damage from domesticated animals is primarily caused by livestock grazing.

Other Pests

Other forest pests, such as the larch casebearer, impact the trees in the Ochoco National Forest at times, but the magnitude of damage is significantly less than those listed above.

Forest Residues

Existing Condition

The Forest currently carries approximately 17 million tons of forest residues in the form of dead woody biomass. Activity residues make up 360 to 720 thousand tons at any one point in time. The rest, 16 2 million tons, is an accumulation of natural dead and down woody material.

Descriptions of the natural vegetation types in this area prior to significant fire exclusion and other management activities (Hall, 1976), provide background information which can be used to estimate natural residue loadings in the Blue Mountains In ponderosa pine types, residual pine types were typically in the 5-10 ton range with isolated areas ranging up to 30 tons. Most of the loading was in large woody material that survived the last fire (or fell since then), and needle and grass accumulation since the last fire. Duff layers were typically shallow, 1-2 inches due to frequent ground fires (see the discussion on local fire history in this chapter). In mixed conifer types, residue loadings were typically 10-20 tons per acre with more woody branch-type material in addition to the larger logs. Duff layers were also deeper, in the 2-4 inch range. This is due to the longer return interval of fire in these damper sites.

An analysis by Forest Interdisciplinary Team members (specialists from wildlife, range, watershed, timber and fire management) indicates that an average of 10.4 million tons of woody residues Forest-wide would provide an acceptable level of dead and decaying biomass to maintain long-term site productivity in local stand types. This represents a per acre loading of about 10.9 tons and is within the range of 8-14 tons per acre recommended for Inland Douglas-fir and associated species (Harvey, et al 1987).

Disposal of this apparent excess (about 7 million tons) is the crux of this management question and this analysis. See Chapter 2 and 4 for discussions on mitigation measures associated with treatment of excess residues and unwanted vegetation. Also, see Chapter 4 for a detailed discussion of the consequences of the alternatives on this resource.

Objectives

Determining how much and what kind of dead woody biomass to leave on site for maintenance or enhancement of long-term productivity. There is a lack of good, local information on how much is desirable for our sites. The most applicable recent work was for Inland Douglas-fir types of the northern Rocky Mountains of Idaho, Montana, and NE Washington. Most current literature dealing with Oregon applies to the wetter forest types of the Cascades and west of the Cascades. The dry, east-side types have not been intensively studied.

The large amount of residues on hand allows for considerable flexibility in adjusting the desired level upward if future research shows that need. There is ample room to take advantage of a wide variety of utilization and disposal options while still retaining adequate levels of residue for site productivity needs Manipulation of woody residues is a practical mitigation measure to ameliorate the effects of timber harvest, which removes much of the standing crop

and often creates major soil disturbance (Harvey, et al, 1987). Forest Service Region 6 direction (FSM 2403, R-6 Supplement 345, 3/85) provides guidance on ways to deal with residue management. Briefly, it states that residual woody biomass shall be considered first for retention on-site for long-term productivity. Any excess to that site need shall be made available for further utilization prior to any disposal.

The best utilization of material excess to site productivity needs, and the best disposition of material excess to utilization demand, remain as problems to be resolved.

Resource Concerns

Periodic drought and high lightning fire occurrence may limit the levels of forest residues that can be reasonably maintained on the ground and still prevent unacceptable wildfire losses.

Lack of the right temperature/moisture conditions (especially in ponderosa pine and associated species types) may limit the speed of organic decomposition commonly experienced in warmer/wetter environments, such as western Oregon and Washington (Harvey, et al, 1987). This can lead to accumulation of site nutrients in above-ground biomass out of reach of the roots in the soil layers. Many dry soils of the Intermountain West approach deficiencies in one or more nutrients within 125-150 years due to above ground nutrient storage in dead woody biomass (Behan, 1970).

Leaving too much residue above natural levels increases the likelihood of unacceptable damage to soils and vegetation from wildfires when they do occur (Hall, 1976; Harvey, et al, 1987; Boyer and Dell, 1980, Volland and Dell, 1981).

Too much residue on a site may inhibit herbage production and access for wildlife and livestock (Hall, 1976; Volland and Dell, 1981). Tree planting costs increase rapidly with increased residue loads.

Fuelwood

For many years firewood gathering was an incidental program on the Ochoco National Forest and Crooked River National Grassland. Firewood from the desired species and of the desired size was readily available close to towns for the relatively few local residents using wood fuel. Larch and juniper were the primary species utilized.

As a result of the oil crises of 1974 and 1979, many people began to view wood as an economical and reliable method of home heating. Firewood permits issued by the Ochoco National Forest and Crooked River National Grassland increased from 303 in 1971 to a peak of 7,361 in 1981. As a result, firewood close to population centers is now generally scarce, and smaller pieces of less desirable species must be used.

Lodgepole pine has become a favored species in recent years, primarily due to an increase in the number of dead snags caused by mountain pine beetles. Timber sale residues have also become a major source of firewood. The practice of yarding unmerchantable material to landings adjacent to roads has helped make this wood available.

The volume of firewood removed from the Ochoco National Forest and Crooked River National Grassland has declined since 1984 to less than 6,000 cords annually. This is due to a combination of factors, including high employment levels, abundance of dead lodgepole on the Deschutes National Forest, and the lack of quality wood cutting areas close to population centers on the Ochoco National Forest and Crooked River National Grassland. Future demand for firewood will depend on factors such as: the relative costs of alternate energy supplies, the distance of firewood supplies from towns, levels of logging residue available, and competition for the use of logging residues from the chip market.

Lands

The Ochoco National Forest and Crooked River National Grassland administer a lands adjustment program that frequently requires coordination with other land management agencies and private landowners to obtain easements and implement land exchanges. Land easements are obtained to provide temporary or permanent access to National Forest lands through other ownerships. Land exchanges are sought to consolidate land ownership in order to improve administrative efficiency.

The special use program deals with permits for special uses. Special use permits cover all uses other than timber sales, firewood permits and Christmas tree permits.

Lands

The Ochoco National Forest and Crooked River National Grassland have about 195,300 acres of private, State of Oregon and other Federal lands within their administrative boundaries. Proposals for land adjustments on intermingled lands are received from the various owners and managers. The Forest Service also participates in land exchanges with other government agencies, such as the State of Oregon and the Bureau of Land Management. The Ochoco National Forest and Crooked River National Grassland exchange lands primarily to block-up management areas or to acquire lands needed to meet management objectives. Congress has not authorized any funds for the purchase of lands by the Ochoco National Forest or Crooked River National Grassland.

Of the 132,970 acres of private land found within the boundaries of the Ochoco National Forest, the majority, approximately 110,000 acres, lies in large tracts along the fringe of the main Ochoco National Forest block The remaining 23,000 acres of private land consist of numerous scattered parcels. Eighty acres of State of Oregon land are found within the Ochoco National Forest boundary - a 40-acre parcel near Mahogany Butte and a 40-acre parcel near Allen Creek. Approximately 6240 acres of isolated parcels of National Forest System lands are scattered within large private tracts. Administration and management of these parcels is generally difficult and expensive.

Table 3-7 shows the acreages in other ownerships within the boundaries of the Ochoco National Forest and Crooked River National Grassland.

TABLE 3-7
OTHER LANDS
(See Any Alternative Map)

Land Ownership	Ochoco National Forest (acres)	Crooked River National Grassland (acres)
Private	132,970	52,670
State of Oregon	80	1,400
Other Federal (Primarily BLM)	0	8,180
Total	133,050	62,250

The 52,670 acres of private land within the Crooked River National Grassland consists of numerous scattered parcels, while the State of Oregon lands and other Federal lands are mostly concentrated along the Crooked, Deschutes, and Metolius Rivers. Land ownership on the east side of the Crooked River National Grassland is much more consolidated than the west side. There are, however, isolated parcels of both private and National Grassland land on the east side.

The Forest Service leases 2,695 acres of land on the Crooked River National Grassland to the State of Oregon for the Cove Palisades State Park. This lease will expire April 19, 1990, but will automatically be renewed for 15 years unless written notice is given by either party 90 days prior to the termination date. The State of Oregon has been responsible for the development and operation of the recreational facilities, while the Forest Service maintains control over minerals and fire management.

Special Uses

Special use permits are issued for a variety of uses and activities. Some examples include: electronic sites, telephone lines, roads, reservoirs, pipelines, airstrips, endurance rides, dog field trials, and other organized group events. Special use permits are grouped into several categories. A summary of the special use permits on the Ochoco National Forest and the Crooked River National Grassland, by category and Ranger District, is displayed in Table 3-8.

TABLE 3-8
SPECIAL USE PERMITS

	Category 1/									
Ranger District	100	200	300	400	500	600	700	800	900	Total
Big Summit	1	0	0	0	0	0	0	3	4	8
Paulina	0	0	0	0	0	0	0	0	3	3
Prineville	4	2	0	0	2	0	1	1	7	17
Snow Mountain	1	0	0	0	0	0	0	0	1	2
Crooked River National Grassland	15	4	1	0	2	16	6	26	5	75
Total	21	6	1	0	4	16	7	30	20	105

1/ Category
100 = Recreation
200 = Agriculture
300 = Community
400 = Industry
500 = Public Information
600 = Energy Generation & Transmission
700 = Transportation
800 = Utilities & Communications
900 = Water

The Ochoco National Forest and Crooked River National Grassland provide transmission corridors and facility locations for various utilities. Eight major transmission lines, 230 KV or larger, cross the Crooked River National Grassland. Numerous small power lines serve wells and residences located throughout the Ochoco National Forest and Crooked River National Grassland. A 36-inch natural gas pipeline crosses the east side of the Crooked River National Grassland from north to south, two smaller lines branch from this mainline to supply the communities of Madras and Prineville. Several telephone lines (buried and overhead), along with two electronic communication sites, are located on the Ochoco National Forest and Crooked River National Grassland.

Demand

The demand for electrical and telephone facilities has been increasing each year as more and more parcels of private land scattered throughout the Ochoco National Forest and Crooked River National Grassland are developed for residential purposes. The demand for transmission facilities is also increasing as population centers in Oregon and California increase. The western leg of a proposed Alaska Natural Gas Transportation System, a 42-inch line, is proposed to parallel the existing 36-inch line on the Crooked River National Grassland. In December 1988, the Federal Energy Regulatory Commission received an application requesting the authority to expand the pipeline system. If this authority is granted, construction on this western leg could begin within 2 years. The construction of another major electric transmission line has also been proposed. This line would cross only private land within the boundaries of the Ochoco National Forest.

Minerals and Energy

Mineral commodities are classified by law into three categories: locatable, leasable and saleable. The manner in which each is managed, and the authority of the Forest Service to control the exploration for and development of each commodity, varies considerably.

Locatable Minerals

Locatable minerals are those minerals which, when found in valuable deposits, can be acquired under the General Mining Laws of 1872, as amended. Examples of locatable minerals on the Ochoco National Forest include, but are not limited to, gold, mercury (cinnabar), and uncommon varieties of gemstones. Citizens and those who have declared their intent to become citizens of the U.S., have a statutory right to explore vacant unwithdrawn public land for these minerals. Upon discovering a valuable deposit, they have a right to locate, mine, and remove the minerals.

Forest Service control of these activities is limited to minimizing impacts on surface resources. This is accomplished by requiring that mining operations are conducted in accordance with an approved plan of operations. The Forest Service reviews the plans of operations to ensure that environmental protection standards are met. These include standards for air, water, cultural resources, and threatened and endangered species. Assuring prompt reclamation or restoration of disturbed lands is accomplished as part of the operating plan process.

The mine operator is required to submit a proposed plan of operations whenever mining operations are likely to cause significant surface disturbance. After receiving a proposed plan of operations, the Forest Service will conduct an environmental analysis and determine whether an environmental impact statement is necessary. The District Ranger will then do one of the following: (a) approve the plan, (b) notify the operator that the proposed operations do not require a plan of operations, (c) notify the operator of any necessary changes in, or additions to, the plan

of operations, or (d) notify the operator that an environmental impact statement must be prepared before the plan can be approved.

If unforeseen surface disturbance occurs during mining operations, the Forest Service may require the operator to furnish a modified plan of operations. In this situation, mining operations may continue unless the operations are causing resource damage that is unnecessary, unreasonable and irreparable.

Designated wilderness areas and other withdrawn areas are not open to mining claim location. However, these areas are subject to valid existing rights perfected prior to the date the area was withdrawn. Refer to Table 3-9 for a list of areas withdrawn from location under the mining laws.

TABLE 3-9
AREAS WITHDRAWN FROM MINING

Area	Acres
Black Canyon Wilderness	13,400
Bridge Creek Wilderness	5,400
Mill Creek Wilderness	17,400
Ochoco Divide RNA	1,920
Delintment Lake	360
Walton Lake	240
Ochoco Ranger Station	230
Ochoco Highway Zone	1,020
Rager Ranger Station	160
Total	40,130

Acquired lands are not subject to location under the 1872 Mining Law, but are subject to mineral leasing under the Acquired Lands Leasing Act as "hardrock leasables." Most of the Crooked River National Grassland was acquired under Title III of the Bankhead-Jones Farm Tenant Act.

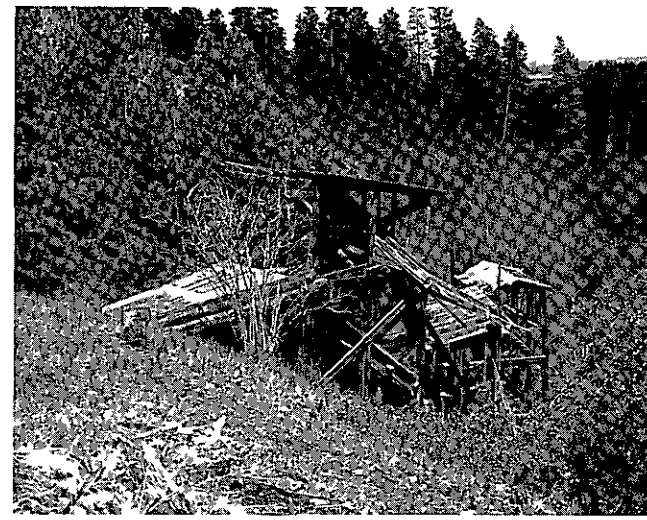
The primary locatable minerals sought on the Ochoco National Forest and Crooked River National Grassland are cinnabar (mercury), gold, and semiprecious gemstones (agate, thunder eggs, jasper, etc.). There are approximately 1,000 mining claims located on the Ochoco National Forest National. Most of the Crooked River National Grassland is not open to mineral entry under the general mining laws.

Mercury and Gold

Approximately 8080 acres on the Big Summit and Prineville Ranger Districts are classified as having high potential for the occurrence of cinnabar (from which mercury is extracted) or gold. An additional 86,400 acres on these Districts, and approximately 19,250 acres on the Crooked River National Grassland are classified as having moderate potential for the occurrence of mercury or gold. Refer to maps entitled Mineral Potential - Locatable Minerals and Mineral Potential - Oil and Gas for a display of where the potential for discovery is concentrated.

A high mineral potential is used where geologic characteristics, favorable for resource accumulation, are known to be present, and evidence exists that indicates mineral concentration or mineralization has taken place. On the Ochoco National Forest, the rating of high mineral potential is based on past mineral production. Refer to Table 3-10 for a list of mines on the Ochoco National Forest which are known to have produced mercury or gold.

A moderate mineral potential exists where geologic



conditions are favorable for mineral accumulation, but where the evidence of mineralization is questionable or has not yet been found. Areas classified as having a moderate potential could be reclassified as having high potential if new information is acquired, or if economic conditions change.

Areas classified as having moderate mineral potential exhibit one or more of the following characteristics:

1. The area is underlain by rocks of the Clarno Formation which have been intruded by igneous rocks, faulted or hydrothermally altered (this is the geology of producing mines in the area).
2. Agate, jasper or thundereggs have been found in the area (these indicate the presence of a epithermal mineral deposit, the type of mineral deposit mined in the area).
3. The Oregon Department of Geology and Mineral Industries sampling programs on the Ochoco National Forest in 1982, 1984, and 1985, or the Bureau of Land Management sampling program on the Crooked River National Grassland in 1986, detected anomalous values of precious metals.

Mining companies have been conducting extensive exploration for large, low-grade epithermal deposits of gold in central and eastern Oregon during the past several years. The discovery of a major gold deposit in eastern Oregon triggered a "rush" in 1988. Large, low-grade gold deposits are generally extracted using open pit mining and heap leaching techniques. On the Ochoco National Forest, the areas classified as having moderate or high potential for the occurrence of gold or mercury are underlain by large, low-grade epithermal deposits, and the Forest and Grassland are experiencing some exploration activity. Thus, the potential exists that the Forest or Grassland could become the site of a major gold mine. This event would trigger an Environmental Impact Statement (EIS) and Forest Plan Amendment.

The rest of the Ochoco National Forest is classified as having a low mineral potential for locatable minerals. This rating is assigned to areas where geologic characteristics are unfavorable for mineral accumulation, or where there is no significant evidence of mineralization.

Areas of the Ochoco National Forest, near the Spanish Gulch and Maury Mountain mineralized areas, are classified as having low potential, because even though they are close to Forest Service land, the geologic features occurring at the mines do not occur on the nearby Ochoco National Forest lands.

Semiprecious Gemstones

Thundereggs, jasper, agate and petrified wood are collected by rockhounds on the Ochoco National Forest. Central Oregon is nationally known for its rockhounding opportunities, and this popular activity is important to the local economy.

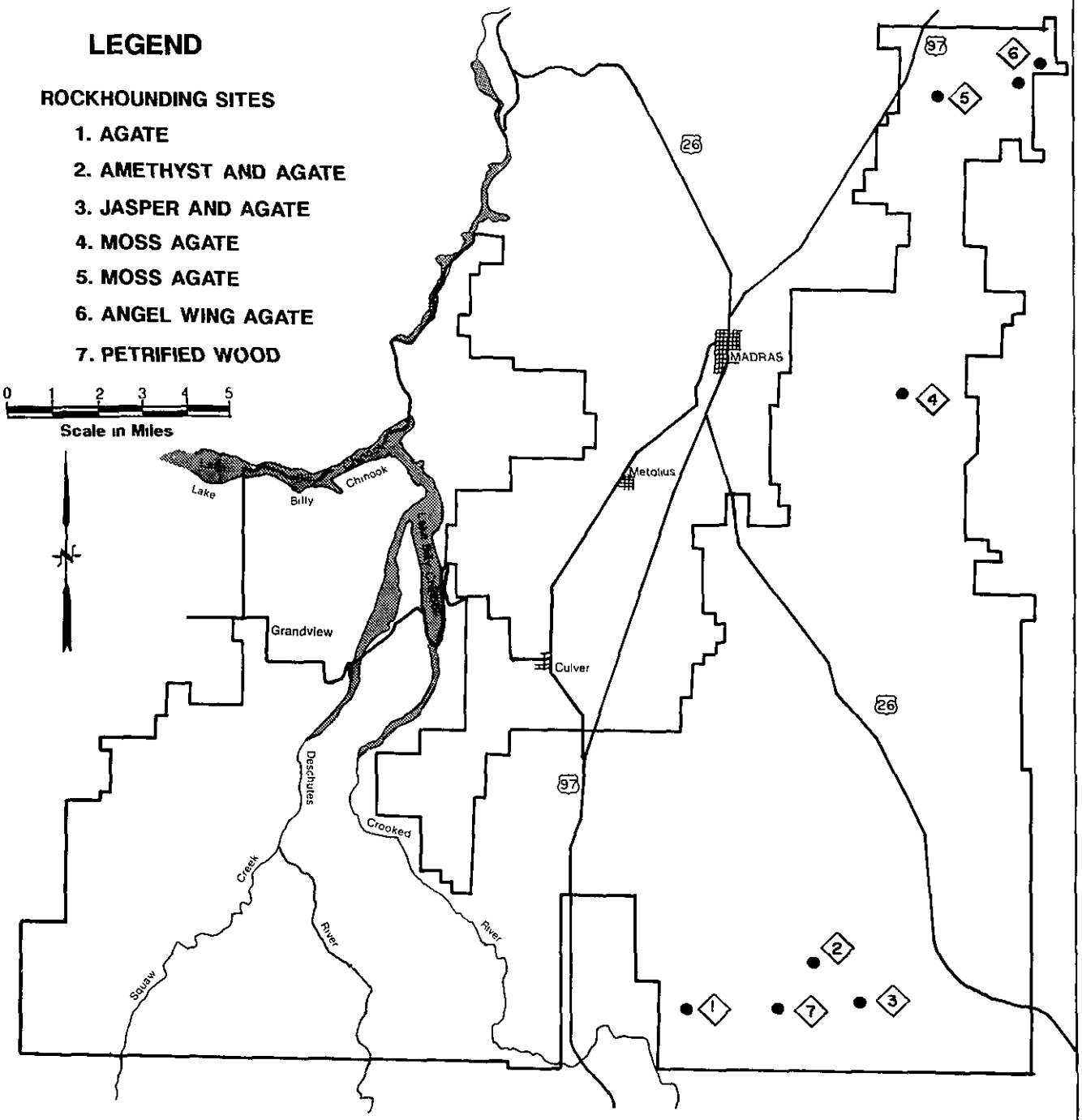
Hunting and collecting rocks and minerals as a hobby does not require a permit or mining claim if the specimens are collected for personal, noncommercial use. Thundereggs, jasper and agate are locatable minerals, and several individuals have located mining claims and are mining these materials commercially. The Prineville Rockhound Club maintains four mining claims for public use, and the Tualatin Valley Gem Club maintains one claim on the Prineville District for these materials. By law (Act of September 26, 1962; 76 Stat. 652), petrified wood is not locatable. Limited quantities of petrified wood may be collected from public lands on a free-use basis.

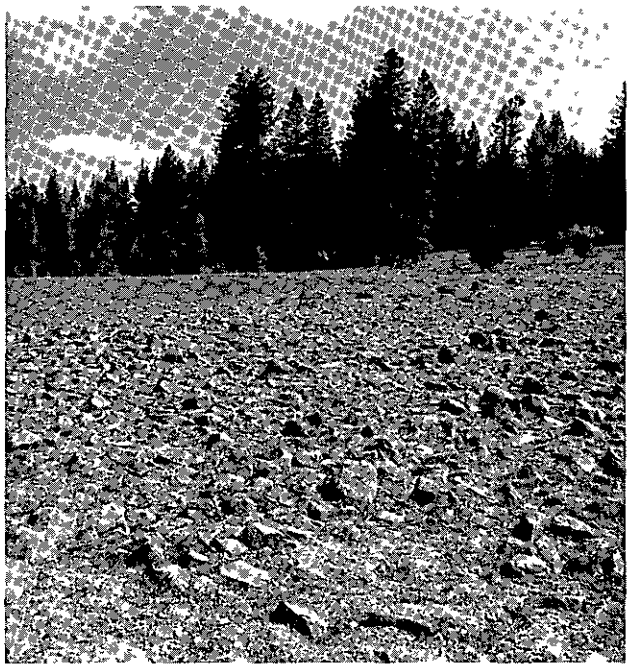
TABLE 3-10
MERCURY AND GOLD MINES

Name	Location	Commodity	Total Historic Production
Kidnap Springs Area			
Strickland Butte Mine	T13S R17E Sec 14	Hg	10 flasks
Allison Prospect	T13S R17E Sec 23	Hg	3 flasks
Kidnap Springs Prospect	T13S R17E Sec 23	Hg	5 flasks
Watson Prospect	T13S R17E Sec 23	Hg	1 flask
Howard Creek Mining District			
Little Hay Creek Prospect	T13S R19E Sec 27	Hg	3 flasks
Taylor Ranch Mine	T13S R19E Sec 34	Hg	248 flasks
Ophir-Mayflower Mine	T13S R20E Sec 29, 30	Au	>2500 oz
Scissors Creek Placers	T13S R20E Sec 30	Au	>500 oz
Byram-Oscar Mine	T14S R18E Sec 23	Hg	63 flasks
Champion Mine	T14S R19E Sec 3	Hg	37 flasks
Staley Mine	T14S R19E Sec 7	Hg	448 flasks
Round Mountain Prospect	T14S R20E Sec 3, 4	Hg	2 flasks
Blue Ridge Mine	T14S R20E Sec 15	Hg	301 flasks
Devils Food Prospect	T14S R20E Sec 16	Hg	1 flask
Mother Lode	T14S R20E Sec 20, 29	Hg	503 flasks
Amity Mine	T14S R20E Sec 32	Hg	409 flasks
Maury Mountain Area			
Maury Mountain Mine	T17S R19E Sec 10	Hg	609 flasks
Towner Mine	T17S R19E Sec 10	Hg	183 flasks
Spanish Gulch Area			
Andrews	T13S R25E Sec 7	Au	Unknown
Waterman	T13S R25E Sec 7	Au	Unknown
Spanish Gulch Placers	T13S R24E Sec 12	Au	5,000 oz

Figure 3-9

ROCKHOUNDING AREA





Leasable Minerals

Leasable minerals are mineral commodities that have been specifically excepted from the General Mining Law by Congress, principally through the following acts: the Federal Onshore Oil and Gas Leasing Reform Act of 1987, the Mineral Lands Leasing Act of 1920, the Mineral Leasing Act for Acquired Lands of 1947, the President's Reorganization Plan No. 3 of 1946, and the Geothermal Act of 1970. Leasable minerals include oil and gas, geothermal resources, and locatable mineral deposits with acquired status (hardrock leasables). These minerals are subject to exploration and development under leases, permits, or licenses granted by the Secretary of Interior.

The Secretary of Agriculture, through the Forest Service, has consent authority for leasing of geothermal resources and hardrock leasable minerals on all National Forest System lands. The Federal Onshore Oil and Gas Leasing Reform Act of 1987 contains key provisions altering the Forest Service's authority for the management of leasable minerals. The Secretary of Agriculture now has consent authority for the issuance of oil and gas leases on National Forest System lands. In addition, no oil and gas permits to drill may be granted without the analysis and approval of a surface use plan by the Forest Service. Regulations implementing these authorities have been published as a proposed regulation in the Federal Register and are being finalized at the National level.

The availability of reserved lands for mineral leasing depends on whether the implementation of development activities could meet land management direction. On acquired lands, permits or leases are subject to conditions ensuring that the lands are used for the purpose for which they were acquired or are being administered.

The policies and procedures by which mineral use authorizations for federally owned leasable minerals are to be processed may be found in the Interagency Agreement between the Forest Service and the Bureau of Land Management (BLM) dated June 19, 1984.

Oil and Gas

The original authority for classification of mineral potential on public lands rested with the U.S. Geological Survey (USGS). This agency classified the State of Oregon in 1976. The following criteria were used to define lands as prospectively valuable for oil and gas:

1. The area is underlain by a section of sedimentary rocks, either marine or nonmarine, 1,000 feet more in thickness;
2. The sedimentary strata have not been metamorphosed or intruded by igneous rocks to the extent that any oil or gas would have been driven off; and
3 The fact that the rocks may now be under a thick cover of lava or other type of deposit does not eliminate them.

Using these criteria, approximately 85 percent of the Ochoco National Forest and Crooked River National Grassland was classified as being prospectively valuable for oil and gas (refer to Map of Mineral Potential - Oil and Gas).

In 1982, the responsibility for classification was shifted from USGS to the Minerals Management Service, and then to the Bureau of Land Management. In 1984, the BLM proposed the following as a new definition for "prospectively valuable for oil and gas":

> A classification of public lands in which geologic data suggest that the underlying rocks may contain the potential for hydrocarbon accumulation.

Unfortunately, due to a lack of funding and staff, the BLM has not reclassified Oregon for oil and gas potential.

The oil and gas potential of the Ochoco National Forest and Crooked River National Grassland remains poorly defined. Although much of the Ochoco National Forest has been leased for oil and gas, very little exploration or development has occurred. One well was drilled in the Maury Mountains (T17S R23E Section 31). This well encountered marine sediments beneath the tertiary volcanic cover. However, much more work will be necessary before the potential is well-understood.

Geothermal Energy

The Oregon Department of Geology and Mineral Industries has classified the entire Ochoco National Forest and Crooked River National Grassland as favorable for the discovery of geothermal resources. This classification is based on various geothermal, volcanic and tectonic phenomena, including thermal wells, youthful volcanism, mineralization, and anomalous concentrations of faults and lineaments However, approximately two-thirds of Oregon is given this classification, and it is probable that only parts of this area are truly underlain by thermal waters.

An unnamed spring producing 10 grams per minute of 85° F water is located at T19S R26E Section 5, on the Snow Mountain Ranger District. Two thermal wells are located near the boundary of the Crooked River National Grassland, southeast of Madras. One well, located in NE1/4NE1/4 Section 24, T11S R13E W.M., intercepts water measuring 25°C (77°F); the other well, with water at 21°C(70°F), is located in SE1/4 NE1/4 Section 24, T11S R13E W.M.

Hydro-electric

The development of hydro-electric power facilities on the Ochoco National Forest and the Crooked River National Grassland is limited by low runoff and unfavorable economic constraints. Existing developments occur at Pelton and Round Butte dams on the Deschutes River, and at Opal Springs on the Crooked River. Several sites have been considered for development that would create impoundments on National Forest System lands, but no licenses have been granted by the Federal Energy Regulatory Commission.

Saleable Minerals

Saleable minerals include common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay. In general, these minerals are of wide-spread occurrence and are of relatively low unit value. They are generally used for construction materials and for road building purposes. Saleable minerals which have some property giving them distinct and special value, remain locatable. Before a deposit can be sold, a determination of "common variety" must be made by minerals staff and legal counsel.

These materials are disposed of under the authority of the Materials Act of July 31, 1947, as amended by the Act of July 23, 1955. Disposal of saleable minerals from public lands administered by the Forest Service is at the discretion of the Forest Service.

Saleable minerals may be disposed of through competitive sale, sale by negotiated contract, or by preference right negotiated sale. Free use permits may be issued to nonprofit associations or government agencies. Mineral materials on lands acquired under the authority of the Bankhead-Jones Act may be disposed of only to public agencies, and are only to be used for public purposes.

The Ochoco National Forest and Crooked River National Grassland produce approximately 147,850 cubic yards of rock annually. This rock is used by the Forest Service, National Grassland, the State of Oregon, and local counties and cities to maintain their roads and highways.

Access Restrictions

Mineral and energy resources on the Ochoco National Forest and Crooked River National Grassland have been classified in terms of "potential" and "existing land access restrictions." Table 3-11 displays the existing land access restrictions in each mineral and energy potential category.

Categories for mineral and energy potential refer to the degree that geologic conditions are favorable for the occurrence of locatable and leasable sources. In this table, "locatable" refers to gold and cinnabar deposits on the Ochoco National Forest. "Leasable" refers to oil and gas on both the Ochoco National Forest and Crooked River National Grassland, and also to gold and cinnabar on the Crooked River National Grassland.

For each mineral and energy potential category, access restrictions have been applied to all lands within the boundaries of the Ochoco National Forest and Crooked River National Grassland, according to specific resource management objectives.

For locatable minerals, the acreage listed as withdrawn represents those areas listed in Table 3-9. The areas classified as having high access restrictions include: wilderness study areas, research natural areas, roadless areas, scenic and recreation rivers, old growth, and developed recreation areas. Areas with moderate access restrictions include: big game winter range, eagle roosting areas, riparian areas, trails, and visual management corridors. All remaining areas, not placed in the withdrawn, high, or moderate categories, have been placed in the low access restriction category.

TABLE 3-11
MINERAL AND ENERGY POTENTIAL
AND ACCESS RESTRICTIONS
(Acres)

	Locatable			Leasable	
Access Restrictions	High	Moderate	Low	Prospectively Valuable	Not Prospectively Valuable
Withdrawn	0	13,020	27,110	34,360	1,840
High	2,080	6,750	60,595	82,105	26,790
Moderate	1,760	13,890	220,610	199,620	52,080
Low	4,240	52,740	441,840	530,505	27,845
Total 1/	8,080	86,400	750,155	846,590	108,555

1/ The total locatable area does not equal the total leasable area due to the provisions of the Bankhead-Jones Farm Tenant Act that require most of the Crooked River National Grassland to be administered under the leasable system

For leasable minerals, the acreage listed as withdrawn represents wilderness areas. In the areas classified as having high access restrictions, leases will be issued with "no surface occupancy" stipulations. In areas having moderate access restrictions, leases will be issued with stipulations restricting operating seasons or requiring facilities be set back from specified features.

Demand

The demand for mineral and energy resources will continue to increase as developed sources decline, and as populations increase. The degree of exploration and development of new sources will fluctuate with economic changes, and mineral and energy shortages.

The collection of semiprecious gemstones may increase slightly, depending on population trends and leisure time activities.

Old Growth

Old growth is an important component of the Ochoco National Forest and the Crooked River National Grassland. The old growth stage in plant succession supports a unique combination of features that provides habitat for over 100 wildlife species, and contributes to biological diversity. Old growth also enhances visual and recreational qualities of the Forest and Grassland.

During the most recent inventory, conducted in 1987, old growth was identified (using the Regional definition) as "any stand 10 acres or greater in size with the following general characteristics: 1) contains mature or overmature trees in the overstory that are well into the mature growth stage; 2) usually contains a multi-layered canopy and trees of several age classes; 3) standing dead trees and down material are present; and 4) evidence of man's activities may be present, but does not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand."

The 1987 inventory was conducted primarily by Ranger District personnel. Stands were delineated using information from aerial photograph interpretation, stand exam data, and local knowledge. Field verification of stand boundaries and condition was not completed for all stands. A total of 93,800 acres of ponderosa pine and mixed conifer old growth were identified and mapped. Of this, 20,500 acres lie within wilderness.

The inventory used in the Ochoco National Forest and Crooked River National Grassland DEIS, conducted in 1982, identified a total of 80,000 acres of ponderosa pine and mixed conifer old growth (along with more than 50,000 acres of old growth juniper). The difference in the estimated totals obtained from the two inventories appears to be due to the old growth definitions and criteria that were used. The 1982 inventory used more specific stand characteristics (which were designed primarily to meet wildlife habitat objectives) than those identified in the Regional definition. Furthermore a 50-acre, rather than 10-acre, minimum size constraint was used for stand selection. Therefore, the broader definition used for the 1987 inventory allowed inclusion of additional stands.

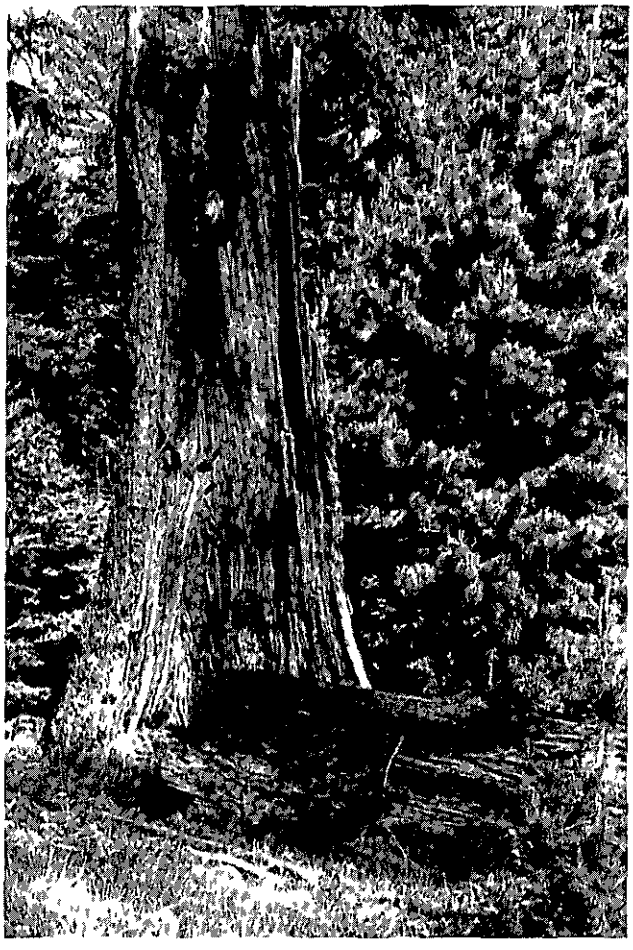
The following definitions were used for the allocation process.

1) Suitable Old Growth meets the Regional definition and provides reproductive habitat for the pileated woodpecker. To the extent possible, 300 acre contiguous stands of old growth were selected, and stands were distributed across the Forest in a 1 per 12,000 acre block pattern.

2) Capable Old Growth does not meet the Regional definition but exists in a site which is capable of producing old growth characteristics in the future. The assumption was made that all lands able to produce 20 cubic feet per acre per year of wood are capable of eventually producing suitable old growth. Capable areas were allocated to expand an old growth stand to 300 acres, or to distribute stands in a pattern that will meet long-term habitat requirements for the pileated woodpecker.

3) Allocated Old Growth (either suitable or capable) is permanently set aside as wildlife habitat during the planning process.

4) Unallocated Old Growth meets the Regional definition but has not been set aside as wildlife habitat during the planning process. Unallocated areas may exist in general forest, wilderness, roadless, and research natural areas.



Recreation

Outdoor recreational opportunities on the Ochoco National Forest and Crooked River National Grassland are generally less primitive than those found on many other National Forests in the Pacific Northwest. A combination of easy terrain, high quality stands of pine timber, and good forage for livestock prompted early commercial use of the area. As a result, 89 percent of Ochoco National Forest lands have been accessed by roads for various management activities.

Recreational Opportunities Spectrum (ROS)

Recreational opportunities on the Ochoco National Forest and Crooked River National Grassland were classified using the ROS land classification system (Clark and Stankey, 1979). ROS inventory identifies recreational settings that vary from an undisturbed natural environment with little human contact to a highly modified environment with frequent human contacts. It serves as a basis for defining the types of outdoor recreational opportunities the Ochoco National Forest and Crooked River National Grassland might best provide. Table 3-12 lists and summarizes the recreational opportunities by ROS classification. The reader is referred to the glossary for specific definitions of each ROS classification.

Developed Recreation

The Ochoco National Forest and Crooked River National Grassland currently maintain 22 campgrounds, 4 boating sites, and 4 picnic areas. These developed recreational facilities have a capacity to accommodate 1880 persons at the same time.

Dispersed Recreation

There are an estimated 950 dispersed recreational sites on the Ochoco National Forest and Crooked River National Grassland that are frequently used during the summer and fall. Most of these sites have no facility development (e.g., toilets, drinking water, tables). Some of the more heavily used sites do have minimal facilities for resource protection and public health purposes, such as pit toilets and potable water.

Specific dispersed recreational opportunities available include hiking, backpacking, picnicking, camping, hunting, fishing, gathering forest products, trail biking, driving for pleasure, bird watching, water skiing, rockhounding, off-road vehicle travel (see Appendix D, Travel Plan, in the Ochoco National Forest Plan), swimming, horseback riding, mountain biking (see publication, "Developing Mountain Bike Opportunities on the Ochoco National Forest, available at the Forest Supervisors Office), winter sports, general leisure, and sightseeing.

TABLE 3-12
RECREATIONAL OPPORTUNITIES

Type of Area	Code Letters	Inventoried Acres (Criteria Boundary)	Acres Currently Managed
Wilderness	W	36,200	36,200
Primitive Not Trailed 1/		3,000	0
Primitive Trailed 1/		3,300	0
Semiprimitive 1/		29,900	36,200
Primitive	P	0	0
Semiprimitive Nonmotorized	SPNM	50,280	29,090
Semiprimitive Motorized	SPM	6,630	0
Roaded Natural and Rural	RN or R 2/	851,390	879,210
Urban	U	0	0
Totals		944,500	944,500

1/ The acreages for these wilderness types had not been compiled at press time

2/ Roaded Natural and Rural categories were combined since they are managed almost identically on this Forest

Source Recreation Spectrum Opportunity Inventory for the Ochoco National Forest and Crooked River National Grassland

Off-Road Vehicle Use

The use of ORV's on the National Forest and Grassland Systems has been recognized as a legitimate recreational pursuit when in concert with the environmental setting, when the effects are minimized on the land and other resources, when public safety is provided for, and when conflicts with other users are controlled. The Forest has been operating under the 1977 ORV Plan to date. This Plan provides both controls and monitoring measures.

The use of ORV's was initially identified as an issue on the Henderson Flat area on the Grassland It was not carried forward in the original ICO's for the DEIS because it was specific to the Grassland and was seen as a local issue that could be dealt with outside the planning process. Henderson Flat continues to be a problem however, and has been the subject of criticism by some publics, including a recent appeal on a decision to sign an existing trail for ORV use. The Prineville Ranger District has also received recent criticism about ORV use and environmental damage.

Problems with ORV use presently fall into two categories: 1) environmental damage when use occurs during periods when soils are subject to damage, and when use occurs on sensitive areas, such as riparian areas, and 2) social issues surrounding those who own and wish to pursue ORV use opportunities on the Forest and Grassland, and those who want to preclude such use as being inappropriate and in conflict with other resources. Off-road vehicle use continues to be a popular recreation pursuit on the Forest and Grassland.

Trails

The Ochoco National Forest and Crooked River National Grassland maintain 96 miles of trails. A majority of the trails exist as short segments of a formerly extensive system that has largely been replaced with roads. Two of the trails, Twin Pillars and Round Mountain, are designated National Recreation Trails. Portions of the Summit Trail have been designated a National Historic Route. Segments of the 19th century Camp Watson Military Road can also be found intact. Approximately 97 miles of snowmobile routes and nine miles of cross-country skiing routes exist.

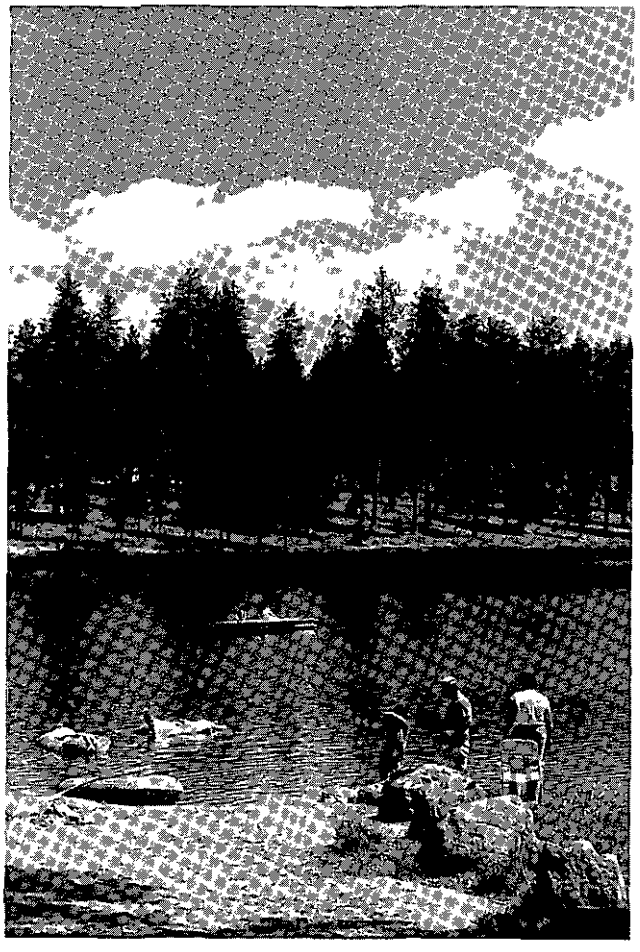
National Recreation Strategy

The Ochoco National Forest is committed to the National Recreation Strategy goal of providing customer satisfaction with more, high-quality recreation services. Customer satisfaction will be improved by seeking out new ideas, providing interpretive services, promoting an outdoor ethic, providing opportunities to all user groups, promoting tourism that will help build strong communities and improve quality of life, and matching human resource needs with recreational opportunities. Partnerships with private enterprise, other agencies, and user groups will be developed to encourage, establish, and sustain a diverse and balanced range of recreational opportunities. The Ochoco National Forest and Crooked River National Grassland will be seeking partners to help to develop and maintain recreational facilities, test innovative ideas, establish mutual cooperation, represent groups with special needs, and provide funding.

Demand

The Ochoco National Forest and the Crooked River National Grassland is heavily utilized for the following four activities.

1. Rockhounding - The Ochoco National Forest and the Crooked River National Grassland contain numerous locations where gemstones may be found. These are of significance regionally, if not nationally, and attract visitors from many areas.
2. Big Game - The Ochoco National Forest and the Crooked River National Grassland contain excellent big game hunting opportunities for both deer and elk, which are also a major attraction to hunters statewide. Many of the hunters come from western Oregon locations, notably Portland and the Willamette Valley.
3. Water-Related Recreation - The relatively few lakes and reservoirs (Antelope, Walton, Billy Chinook, Haystack, and Delintment) on the Ochoco National Forest and Crooked River National Grassland receive heavy use.



4. River-Related Recreation - Sections of the Crooked River, North Fork of the Crooked River, and the Deschutes River have all been classified as Recreational or Scenic under the Oregon Wild Rivers Act. Lower Squaw Creek has been determined eligible for further study under the National Wild and Scenic Rivers Act.

Numerous other managed recreation sites are located on the Ochoco National Forest and Crooked River National Grassland Most are significant only within the Zone of Influence identified earlier in this chapter. These include designated recreation areas at Stein's Pillar, Bandit Springs, Deep Creek, and Lookout Mountain.

Off-road vehicle use is not, at this time, considered a "major" recreational use on the Forest except in specific isolated areas (e.g., Henderson Flats). Demand is expected to increase.

Current recreational use relies heavily on the road system. Road related uses total approximately 90 percent of the present recreational use. The predominate recreational activities are camping, motorized travel, picnicking, and hunting. Recreational use by year and ROS classification is shown in Table 3-13. Recreational use is measured in Recreation Visitor Days (RVD's), which are defined as recreational use of an area for a 12 hour period. The drop in total RVD's between 1970 and 1975 is attributed primarily to the oil embargo and the resulting gas shortage. The overall trend conforms closely with population trends, however, resulting in expectations of continued increases in recreational use for the foreseeable future.

Estimates of future recreational use depend on many uncertain factors and should be viewed as trends useful for making relative comparisons. The following assumptions were made to estimate future recreational demands:

1) For most forms of recreation uses demand follows population trends;

2) Stream fishing demand varies directly with fish habitat and populations; and

3) Construction of trails, trailheads, and campsites shifts demands higher for some categories of recreation use.

Table 3-14 displays a representative set of demand projections by ROS class. The Roaded Natural/ Rural category has been split into two categories to show the differences between developed and dispersed recreation.

TABLE 3-13
RECREATIONAL USE
(Thousand RVD's)

	ROS Classification					
Year	W (Total)	SPNM	SPM	RN/R (Developed)	RN/R (Dispersed)	Total
1965	N/A	27 0	9 0	55 4	166 3	257 7
1970	N/A	32 9	15 6	84 4	253 1	385 0
1975	N/A	24 7	9 6	64 7	194 1	293 1
1980	N/A	35 0	13 7	94 8	284 4	427 9
1988	13 7	28 5	15 2	97.1	290 3	444 8

Source Recreation Information Management System, Ochoco National Forest Files

TABLE 3-14
RECREATIONAL DEMAND
(Thousand RVD's)

	ROS Classification					
Year	W (Total)	SPNM	SPM	RN/R (Developed)	RN/R (Dispersed)	Total
1990	15 5	32 2	17 0	117 4	345 8	527 9
2000	17 2	35 4	18 8	134 1	384 2	589 7
2010	18 4	38 3	20 2	145 6	410 4	632 9
2020	19 8	41 3	21 8	158 3	435 3	676 5
2030	21 8	44 8	23 6	172 4	468 4	730 7

Scenic Resources

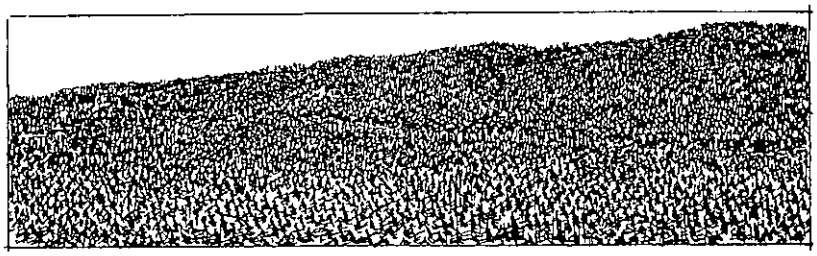
The Ochoco National Forest and Crooked River National Grassland encompass a variety of vegetation, climatic, and geologic zones. These zones can be observed from the Crooked River National Grassland's rolling range country that is interspersed with deep canyons and scattered volcanic buttes to the Ochoco National Forest's extensive stands of ponderosa pine and unique rock features. Most visitors travel through the Ochoco National Forest on Highway 26, which passes through open park-like stands of old growth ponderosa pine. The degree of visitor sensitivity to these stands is difficult to quantify, but the public is perceived to enjoy seeing large yellow-barked pine trees in open park-like settings.

The appearance of the Ochoco National Forest and Crooked River National Grassland has changed over time. Elimination of fire, and an accompanying change in plant succession, has had the most effect. In the past, these changes have been gradual and not always readily evident to the casual observer. Recent intensive management practices, such as timber harvest, wildfires, livestock grazing, and road construction, have increased the apparent rate of change on the landscape, and modifications have become more obvious. Visual impacts of clearcutting and prescribed burning are the most notable.

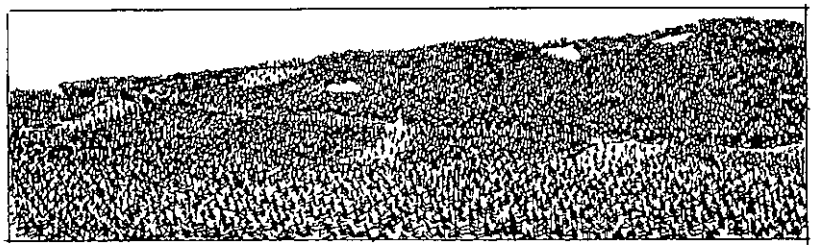
The scenic resources of the Ochoco National Forest and Crooked River National Grassland have been inventoried in terms of Visual Quality Objectives (VQO's). These categories are based on the presence or absence of distinctive scenery, proximity to viewpoints, and the amount and type of traffic through viewing areas. Each category describes the degree of acceptable alteration from the natural landscape that would be consistent with scenic objectives. Land in the "preservation" category consists of the existing wilderness areas. The "retention" category contains roadless areas managed to retain roadless characteristics under current plans, and foreground corridors along major roads and trails. Corridors along other heavily used roads fall into the "retention" and "partial retention" categories. Remaining lands are inventoried as "modification" or "maximum modification". These two categories have been grouped, since the effects on management are very similar. A detailed description of these categories can be found in the glossary under the heading "Scenic Quality Objectives." Table 3-15 shows the amount of Forest and Grassland presently in each category. Figure 3-10 illustrates the appearance typified by timber harvest activities in each category.

Figure 3-10

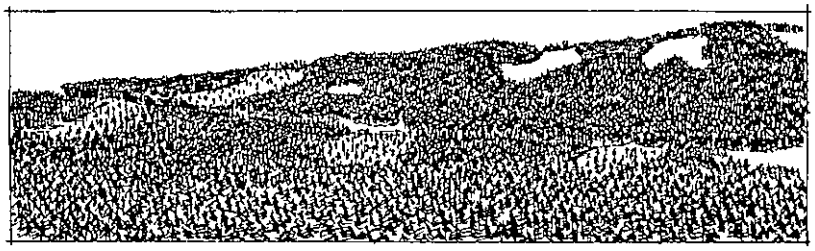
VISUAL QUALITY OBJECTIVE CATEGORIES



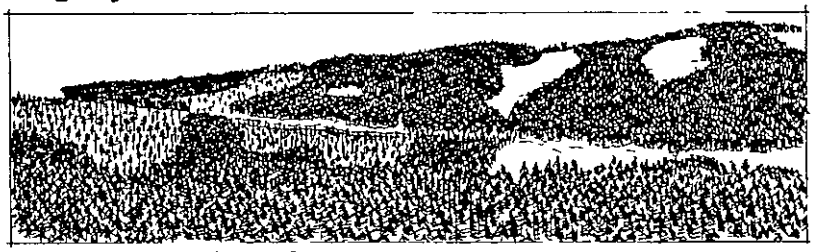
Natural — PRESERVATION



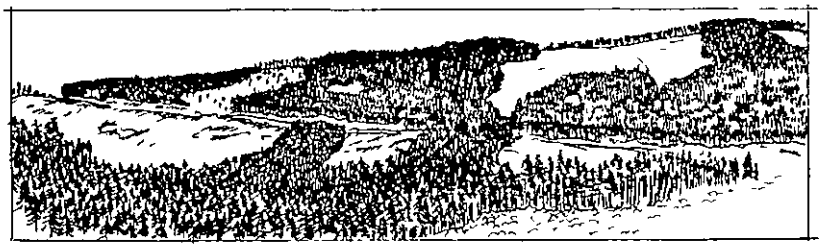
Natural Appearing — RETENTION



Slightly Altered — PARTIAL RETENTION



Moderately Altered — MODIFICATION



Heavily Altered — MAXIMUM MODIFICATION

TABLE 3-15
EXISTING SCENIC OBJECTIVES

Category	Acres	Percent of Forest & Grassland
Preservation	38,260	4%
Retention	102,220	11%
Partial Retention	71,370	7%
Modification and Maximum Modification	743,250	78%
Total	955,100	100%

Source Visual Quality Objective Inventory for the Forest and Grassland

Social and Economic Setting

The "Zone of Influence" for the Ochoco National Forest has been examined at three levels.

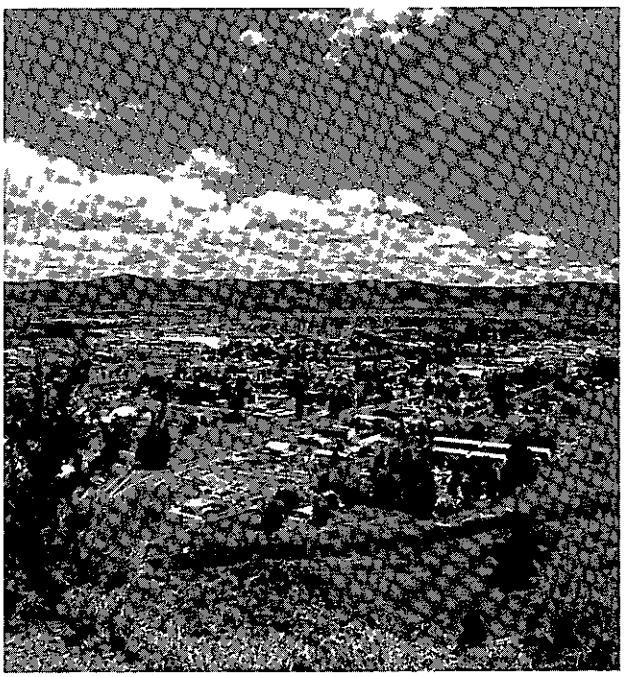
Zone of General Influence: the area on which the Ochoco National Forest has a definite and measurable effect.

Zone of Primary Influence: the area which the Ochoco National Forest significantly affects.

Zone of Extended Influence: this is the largest area on which the Ochoco National Forest makes an impact. The effect of the Forest might not be significant on any single community outside the Zone of General Influence; nevertheless, the total effects on all such communities are significant.

Zone of General Influence

The Zone of General Influence for the Ochoco National Forest and Crooked River National Grassland consists of six Oregon counties. The Ochoco National Forest is located in Crook, Grant, Harney, and Wheeler counties. The Crooked River National Grassland lies entirely in Jefferson County. Deschutes County is added to the Zone of General Influence because its population and economy make use of Ochoco National Forest and Crooked River National Grassland resources. These six counties are shown in Figure 3-11, and the amount of Ochoco National Forest and Crooked River National Grassland acreages in each county are shown in Table 3-16.



A "Socio-economic Overview" containing more detailed information was prepared for the six-county region, and is located in the Ochoco National Forest Supervisor's Office.

TABLE 3-16
NATIONAL FOREST AND GRASSLAND
ACREAGES BY COUNTY

County	Ochoco NF Acreage	Crooked River NG Acreage
Crook	434,050	0
Deschutes	0	0
Grant	59,400	0
Harney	222,280	0
Jefferson	0	111,380
Wheeler	128,810	0

Zone of Primary Influence

The Zone of Primary Influence is considered to be only those counties which are directly affected by the management decisions of the Ochoco National Forest. Crook and Harney counties constitute this zone.

The Forest's contribution to the economies of Crook and Harney counties is substantial, but it varies over time. It depends upon how much timber of what species is processed locally. This in turn is related to timber prices, which tend to rise and fall with the general health of the national economy. (The higher the price of the timber, the less significant hauling costs are, and the greater the percentage that may be purchased by more distant operators.) Another factor involved is the desire of local remanufacturing companies to buy local milled lumber. Even the personalities of mill executives can affect decisions to buy or not to buy Forest timber.

Figures from 1987 indicate that one million board feet of Forest ponderosa pine generates 11 local jobs and $220,000 (1987 dollars) of local income. One million board feet of associated species generates three local jobs and $60,000 in income.

Crook County

Crook County has a population of 13,500 with 5,455 people living in Prineville, the County seat and only incorporated city. Out of a total of 4,270 wage and salary jobs in the county, 1,600 (37%) are in wood processing, and an additional 830 (19%) are in government (Business and Employment Outlook, District 10, 1988-89).

Prineville has 13 employers with more than fifty employees. Of these, seven are milling or re-milling firms, four are governmental agencies, and the remaining two are the Pioneer Memorial Hospital and the Les Schwab tire production facility. Sawmill employment has declined from 620 jobs in 1977, to 450 in 1988. A dramatic increase in millwork employment (from 540 jobs in 1977, to 1200 in 1988) has compensated for this decline, however.

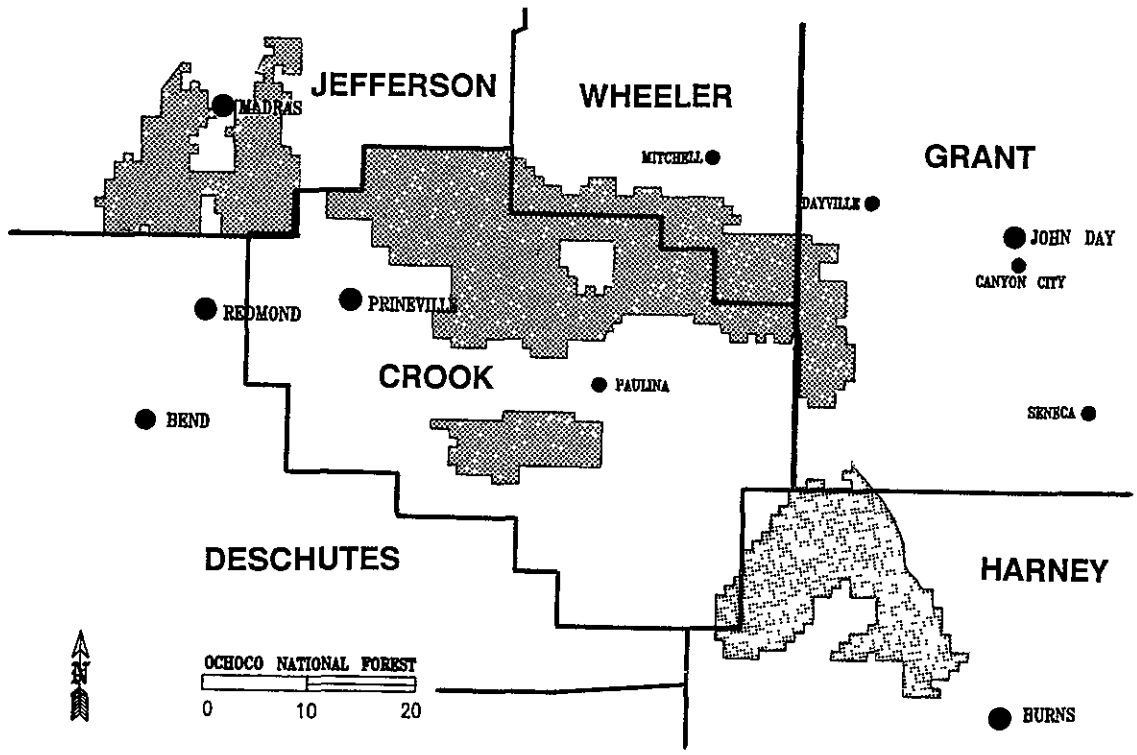
Prineville's wholesale and retail trade sectors compete with the Bend urban area 35 miles away and, to a lesser extent, with the Redmond area 18 miles away. Retail sales per capita for the State of Oregon are $5,454; they are $6,467 for Deschutes County and only $2,857 for Crook County (Oregon County Economic Indicators 1984, pp. 1 and 17).

Harney County

Harney County has 7,100 inhabitants including 4,175 residents of Burns and Hines. The county has a wage and salary employment of 2,180 jobs. This includes 460 (21%) wood products jobs and 720 (38%) government jobs (Business and Employment Outlook, District 14, 1988-89).

Since 1980, when the Hines Mill closed and was put up for sale, the Harney County economy has rebounded. Snow Mountain Pine purchased the mill, invested in plant modernization, and diversified the product line. Currently, mill employment is at a lower level than before the modernization, and the Burns/Hines economy is still substantially dependent on the milling of logs. The analysis of Harney County contained in this document assumes that Snow Mountain Pine will be able to continue production at its present level of output.

Figure 3-11
SIX COUNTY DISTRIBUTION MAP



Changes in the Structure of the Wood Products Industry

The wood products industry has been undergoing significant and fairly rapid changes. Major changes include:

New "small log" log mills designed to process the smaller diameter of timber that will be increasingly harvested in the future;

Increased mechanization, both in the woods and in the sawmills; and

Increased mechanization in the remanufacturing mills, along with production of more "finished" projects.

It is somewhat difficult to compare the future employment levels that will be produced by the small log mills with the historic employment levels produced by the large log mills. On the one hand, more work is needed to produce the same volume, on the other, more of the work is mechanized.

The effects of increased mechanization, both in the woods and in the sawmills, have been reported both in the popular media and in professional literature. One study in Montana shows that the output of lumber per sawmill worker increased more than 80% from 1980 to 1986 (Keegan and Polzin, 1987). Another Montana study shows a doubling in lumber output per dollar cost (Keegan, Martin, and Stevenson, 1987) This second article also states that there are factors other than modernization that contribute to these increases, but the authors attribute two

thirds of the change to modernization. Lumber production levels, they say, were nearly as high in 1986, as in the boom period of the late 1970's, but employment is far less.

Local counties have followed the same pattern of resumed high production with less employment. The Ochoco National Forest obtained data regarding employment and production levels from the mills in Crook and Harney counties for the years 1977, 1981, and 1987. The totals are shown in Table 3-17.

TABLE 3-17
TOTAL SAWMILL PRODUCTION AND EMPLOYMENT
CROOK AND HARNEY COUNTIES

	1977	1981	1987
Total MBF	285,000	87,000	278,000
Employment	1604	266	641
MBF Per Employee	180,000	330,000	430,000
Number of Mills	7	4	5

* MBF - Thousand board feet

Total Sawmill Production and Employment, Crook and Harney Counties

The figures in Table 3-17 show that nearly the same output was produced in 1987 as in 1977, but with 60 percent fewer employees. Also, the number of mills declined from seven to five.

The remanufacturing industries have also been improving their plants, but the effects seem to be different. One might assume that here also, mechanization would cost jobs. However, the plants are producing more "finished" products such as complete door casings, or laminates of hardwood over pine. Remanufacturing employment in Crook and Harney counties has steadily increased over the last ten years, which seems to indicate that this mechanization is creating jobs, not eliminating them.

Zone of Extended Influence

The Zone of Extended Influence is considered to be the State of Oregon. The Forest affects this extended zone in three significant ways.

A portion of Forest timber is milled or remanufactured outside the other Zones of Influence but inside the State.

Elk and deer hunters come from many parts of the State, especially Portland and other cities in the Willamette Valley. An estimated 6200 RVD's are generated annually in big game hunting from this zone.

Other recreational users come to the Forest from throughout the state.

One million board feet of Ochoco National Forest ponderosa pine produces 14 jobs statewide, and $290,000 in income. One million board feet of associated species generates five jobs and $100,000 in income.

Social Setting

The Social-Economic Overview of the Ochoco National Forest and Crooked River National Grassland[1] lists six "lifestyle" categories into which many of the six-county residents fall. These categories are Native Americans, ranchers, loggers, mill workers, small-town merchants, and government employees.

The Native Americans consist mainly of the Warm Springs Confederated Tribes located in Wasco and Jefferson counties (the largest group), and the Paiutes in northern Harney County.

All of the lifestyles occurring in the area are affected by decisions relating to management of the Ochoco National Forest and Crooked River National Grassland. The rancher, the logger, the millworker and perhaps the Native American depend directly on the Ochoco National Forest for jobs, wood, and forage. Significant numbers of public service employees' jobs are related to the Ochoco National Forest, and the local merchants depend on the economic well-being of all groups. Thus, significant

[1]Spitz, J 1982 Socio-Economic Overview of the Ochoco National Forest and Crooked River National Grassland Mimeo 137 p

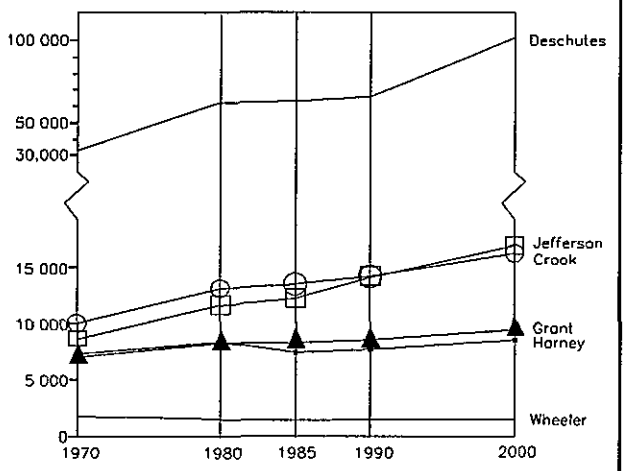
changes in Ochoco National Forest management can affect lifestyles and community well-being.

Residents of the area are involved with Ochoco National Forest activities relating to leisure. Their lifestyles emphasize recreational uses of the Ochoco National Forest and Crooked River National Grassland in many ways.

Demographics

Table 3-18 and Figure 3-12 present population figures for the region. Deschutes County was the fastest growing county in the state during the 1970's, and rapid growth is anticipated through the end of the century. Nearly 60 percent of the people in the six-county area lived in Deschutes County in 1980. The percentage is projected to rise to 66 percent by the year 2000. Jefferson County is also growing rapidly and will soon be the second most populous county in the six-county area.

Figure 3-12
County Population



The remaining counties are more rural and will not likely share in the anticipated growth. Crook, Grant, and Harney counties grew substantially in population during the 1970's when the timber market was strong, but the population has remained stable or decreased during the years 1980 - 1985. Wheeler County's sawmill closed in the 1970's, resulting in a population decline for that decade. The projections from 1980 through the year 2000 predict little change in population for those counties.

Table 3-19 displays data about minorities in the area. Jefferson County has the largest percentage of minorities because of the Warm Springs Indian Reservation and a large Hispanic population. Hispanics are the largest minority group in the other counties (except Wheeler, which has no recorded minorities) and are the fastest-growing minority group in the six-county region.

Indian Rights and Claims

Activities of the Ochoco National Forest affect two American Indian Reservations: the Warm Springs Confederated Tribes located in Wasco and Jefferson Counties, and the Paiutes in northern Harney County.

The American Indian Religious Freedom Act (Public Law 95-341) of 1978 states, "That henceforth it shall be the policy of the Unites States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites." Under the Tribes of Middle Oregon Treaty of 1855, rights such as hunting, fishing, and root gathering are reserved to the Tribes in the area ceded by the Tribes.

TABLE 3-18
COUNTY POPULATION - ZONE OF GENERAL INFLUENCE

Year	Crook	Deschutes	Grant	Harney	Jefferson	Wheeler
1970	9,985	30,442	6,996	7,215	8,548	1,849
1980	13,091	62,142	8,210	8,314	11,599	1,513
1985	13,400	65,400	8,230	7,350	12,150	1,430
1990	14,100	75,800	8,500	7,700	14,000	1,500
2000	16,200	102,100	9,400	8,500	16,900	1,500

Source Business and Employment Outlooks, Program Year 1988 and 1989, JTPA Districts 10, 12, and 14 Chapter 2 and Appendix B State of Oregon Employment Division, Department of Human Resources

TABLE 3-19
MINORITY POPULATION - ZONE OF GENERAL INFLUENCE
(% OF TOTAL POPULATION)

Minority	Crook	Deschutes	Grant	Harney	Jefferson	Wheeler
Native Americans	1 6	0 6	1 0	2 5	16 6	0 0
Hispanic	2 6	1 8	1 7	3 7	7 4	0 0
Other Minorities	0 7	0 6	0 0	0 7	0 3	0 0
Total Minorities	4 9	3 0	2 7	6 9	24 3	0 0

Source State of Oregon Employment Division, Department of Human Resources, Jason Yohannan, Eastern Oregon Regional Economist

TABLE 3-20
ECONOMIC MEASURES
ZONE OF GENERAL INFLUENCE AND STATE OF OREGON

Category	Crook	Deschutes	Grant	Harney	Jefferson	Wheeler	Oregon
Average Per Capita Income (1984)	$10,525	$10,337	$9,477	$10,279	$10,963	$12,011	$12,399
Unemployment Rate (1987)	7 5	7 8	9 6	7 9	6 6	10 3	6 2
% Economically Disadvantaged Age 14+ (Projected 1988-89)	18 9	18 9	20 2	16 0	22 5	30 5	18 6
% AFDC Recipients (Projected 1988-89)	0 8	0 6	0 6	0 6	1 2	0 0	1 0

Source: Business and Economic Outlook, Program Year 1988 and 1989, JTPA Districts 10, 12, and 14 Chapters 2 and 6. State of Oregon Employment Division, Department of Human Resources

Both the Warm Springs Confederated Tribes and the Paiutes have traditional areas of the Ochoco National Forest for root gathering and berry picking.

During the development of this FEIS and Ochoco National Forest Plan, recognition was given to the importance of the Comprehensive Plans for both the Warm Springs Confederated Tribes and the Paiutes of Northern Harney County.

Economic Conditions

Table 3-20 gives an economic picture of the region. Wages are around 10% lower than the state average and 20% lower than the national average (not shown). Employment in the region is higher than the state average. However, the percentage of those who are "economically disadvantaged" and the percentage of Aid For Dependent Children (AFDC) recipients generally follow the state average. The exception is Wheeler County, which has the most unemployment, the highest percentage of economically disadvantaged persons, the highest per capita income, and no AFDC claims.

Figure 3-13
County Economic Bases

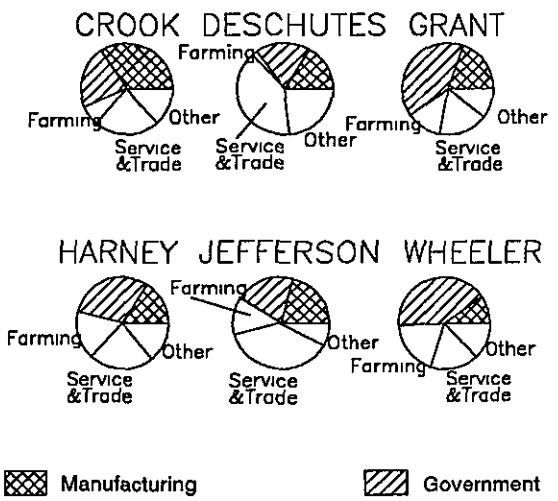


Figure 3-13 shows the economic make-up of the six counties. Most of the manufacturing sector is the milling or remilling of timber, and much of the government sector concerns forestry. Combining these sectors together gives a rough idea of the importance of the wood products industry in each county. This combination is indicated by the shaded areas on the graphs.

The Deschutes County and Jefferson County economies are the most diversified; the timber industry is surely important, but there are other well-developed economic sectors also. In contrast, Crook and Grant counties are heavily dependent on timber, and to a somewhat lesser extent, Harney County is also. Wheeler County's private economic sectors are small by contrast. The government sector dominates there.

A special factor of economic importance is the 25 percent monies, i.e. the distribution of 25 percent of total federal receipts to the counties. These monies are distributed according to the proportion of National Ochoco National Forest and Crooked River National Grassland acres in each county, and are often an important part of the counties' budgets. Data for fiscal year 1983 is shown in Table 3-21. Crooked River National Grassland monies are handled in a separate account from Ochoco National Forest monies.

TABLE 3-21
25% FUNDS DISTRIBUTED TO COUNTIES

County	Total County Budget		25% Monies		% of Total County Budget	
	FY 1983	FY 1987	FY 1983	FY 1987	FY 1983	FY 1987
OCHOCO NATIONAL FOREST						
Crook	3,589,600	7,222,200	1,135,800	3,985,100	32	55
Grant	4,790,100	11,613,000	154,900	545,300	3	5
Harney	5,410,900	8,886,900	584,500	2,049,600	11	23
Wheeler	1,136,500	1,741,200	333,800	1,182,700	29	68
CROOKED RIVER NATIONAL GRASSLAND						
Jefferson	3,735,138	4,146,371	16,600	6,000	0 4	0 1

Soil

Soil development across the Ochoco National Forest and the Crooked River National Grassland has been influenced primarily by geologic events and climate, along with the interactions of topography, time, vegetation, and biological processes. Soil development has occurred on assorted geologic materials that were covered by volcanic ash from Mt. Mazama (Crater Lake) about 6700 years ago. Basalt and andesite flows are the primary materials on much of the Forest east of Lookout Mountain (approximately 40% of the total Forest and Grassland area). Older andesites, basalts, and pyroclastic sediments underlie most of the area to the west of Lookout Mountain (approximately 23 percent of the total area). Soils are often weathered to clays in this portion of the Forest. Resistant welded tufts are found extensively south of Snow Mountain (approximately 17 percent of the total area). The remaining 20 percent of the Forest and Grassland contains scattered pockets of highly weathered tufaceous sediments, recent landslide debris, sedimentary rocks, rhyolite, and metasedimentary rocks.

The Soil Resource Inventory (Ochoco National Forest, 1977) for the Ochoco National Forest and Crooked River National Grassland identified 111 different land types occurring separately or in combination with other land types. Land types reflect differences in soil, vegetation, and landforms. There are approximately 10-12 different soil types represented in this classification. Three broad soil type categories have been identified for use in management activities: volcanic ash, residual, and nonforest soil types. Table 3-22 describes the three soil types and their related management implications in general terms.

Volcanic Ash Soils

These soils compose 30 percent of the entire Forest and Grassland area, and approximately half of the forested lands. Ash soils were formed from widespread air-fall volcanic ash deposited from Mt. Mazama about 6700 years ago The present distribution of volcanic ash soils has resulted largely from the influences of topography and elevation on wind and precipitation patterns. Most of the more recent air-fall volcanic ash deposits from Mt. Mazama have been re-worked onto north and east slopes, basins,

and broad upland plateaus. The present dry climate of the Forest and Grassland does not favor the weathering of volcanic ash soils.

Residual Soils

These soils (comprised of loess, volcanic ash, old and weathered volcanic ash, and residual materials)

TABLE 3-22
OCCURENCE OF GENERAL SOIL TYPES

Soil Type	Depth	Texture	Management Hazards/ Limitations	Percent of Forest and Grassland
Volcanic Ash	>6" ash overlying residual materials, 1-3 feet total depths	Overlying loams, clays and assorted gravels & cobbles in places	High compaction and displacement hazard under a wide range of soil moistures	30
Residual (mixed with loess & ash)	1-1/2 to 2-1/2 feet	Silt loams, clay loams, clays with assorted gravels & cobbles	- High surface erosion hazard & muddiness potential from skidding & roads in wet season - Low timber production - Dry sites potentially difficult to regenerate	30
Nonforest	<1 foot	Gravelly loams & clay loams	- Droughty, low vegetative capacity - High erosion hazards & muddiness potential from roads - Low water holding capacity	40

Ash soils range in color from dark brown to yellowish brown, with many deposits being light gray to nearly white when dry. They have a sandy loam texture with a gritty feel, and are homogenous with little structural development. Gravels and cobbles are prevalent in these soils due to colluvial action (the movement of rock fragments and other soil materials as a result of gravitational action) and uprooting of trees by wind.

Ash soils are generally found on the more moist sites. These soils compact easily, are susceptible to displacement, but are also the most productive soils on the Forest.

compose 30 percent of the entire Forest and Grassland area, and approximately half of the forested lands. Residual soils are clayey soils that were formed from widespread continuous air-fall volcanic ash deposited between 20 and 30 million years ago. These soils lack the distinct volcanic ash layer, which has either eroded off or mixed with the underlying soil materials. Residual soils are found on south facing slopes, exposed slopes with northerly aspects, and as buried soils on north and east exposures.

As a rule, residual soils have thicker, darker surfaces and exhibit better cohesion than volcanic ash soils. Residual soils are nongravelly to gravelly with a loam, silt loam, or clay loam texture. These soils have better structure than ash soils and are more resilient.

However, the productivity of residual soils is lower than ash soils, and reforestation on residual soils can be difficult on droughty sites.

Nonforest Soils

These soils make up the remaining 40 percent of the area. These soils are generally more shallow and have a higher rock content than the other two soil types. Nonforest soils with sparse ground cover, low water holding capacity, and on southerly aspects have high erosion hazards. Some of these soils have little vegetative cover at the present time, and there is no potential to increase this protective ground cover. There is high potential for stream sedimentation and other types of water degradation resulting from management activities on these soils.

Cumulative Effects/Long-Term Soil Productivity

Soil is a basic nonrenewable resource. The demands for sustained timber and forage production create a need for maintaining long-term soil productivity. The ability of soils to remain productive depends largely on the management practices allowed. Future management will likely include rest rotation grazing systems, shorter rotations of timber, the use of fertilizers, mechanical timber harvesting, and more complete utilization of woody residues. The cumulative effect of repeated activities, over a long period of time, has the greatest potential of lowering forest soil productivity. Thus, the maintenance or enhancement of the soil resource is, by necessity, a primary goal of management.

By definition, the components of long-term soil productivity have been identified as the preservation of:

1. Surface litter and topsoil layers,
2. Soil organic matter and its replacement;
3. Soil organisms and biological systems; and
4. Soil porosity, structure, drainage and aeration.

Air and water movement into and within the soil affect biological activity, and ultimately nutrient availability necessary for vigorous plant growth. Changing the soil properties through human activities which induce compaction, puddling, erosion, displacement, or mass movement (Boyer, 1981) will lower the site's ability to produce. In particular, soil compaction on many sites has led to decreased water infiltration, accelerated erosion of topsoils, and damage to soil biological systems.

The goal is to maintain or enhance soil productivity. This allows the Forest Soil Program to measure, quantify and evaluate the effects of management activities on the natural capacity of soils to heal after disturbances. The "Forest-Wide Standards and Guidelines" (Appendix D) for soils provide a basis from which to measure these changes.

The prevention of damages before they occur is better than trying to rebuild the productive capacity. In the past, the Forest has used soil moisture as a criteria to control ground skidding equipment. This has had limited success because of varing soil moisture levels within a sale area. The current emphasis is toward a "fixed ground skidding" network designed to concentrate the disturbance within allowable levels. Where lands exceed these levels of soil damage, reclamation measures are warranted. These may include tillage of compacted soils, back blading of mounds or berms, fertilization, or spreading of biologically rich organic materials to rebuild the organic matter levels.

"Caring for the land" starts with good land stewardship and ethic. This will require changes to many of our presently acceptable operations. These changes will take time, but on many sites we have just began the cutting cycles which will go on, generation after generation, for hundreds of years.

Timber

Management of the timber resource affects many other resources and has significant economic affects. Timber management activities affect fish and wildlife habitat, recreation, water, and forage, as well as other resource values and uses. Economic returns from timber sales contribute significant sums to both the Federal Treasury (approximately $28 million in 1988) and local counties (over $7 million in 1988).

Historical Perspective

Past management practices have had a major influence on today's conditions. In the late 1800's, the Forest was mostly open pine stands with grass or scattered pine reproduction in the understory (The Oregon Trail, 1977). Grazing and repeated wildfires (see Fire, this chapter) perpetuated this condition into the early 1900's (Hodgson, 1913). In the mid 1900's, fire prevention and control of grazing permitted the establishment of white fir and Douglas-fir on the upper elevations and north slopes and

dense thickets of ponderosa pine on south slopes. In the 1940's and 1950's logging became a major influence on the Forest. Logging at this time emphasized partial cutting in ponderosa pine stands. Generally, the old growth pine was removed, leaving an understory of pine seedlings and saplings. Stocking was usually clumpy with openings occurring between thickets of pine reproduction. Mixed conifer stands were generally avoided because they were found on steeper slopes and contained less valuable species. When these stands were logged, only the ponderosa pine was removed, accelerating succession to white fir and Douglas-fir.

Timber harvest in the 1960's and 1970's also emphasized partial cuts from two-storied stands of ponderosa pine. Many of the residual understories have been thinned. The Forest completed a total of 39,000 acres of thinning between 1972 and 1984. Some shelterwood regeneration cutting in ponderosa pine types and clearcutting in mixed conifer types also occurred in the latter part of this decade.

Timber Resource Plan

Timber harvesting in the 1980's was conducted under the direction outlined in the Timber Resource Plan for the Ochoco National Forest. This Plan was approved by the Regional Forester on May 1, 1979, and was implemented on October 1, 1979. The Timber Resource Plan was intended to be in effect for 10 years (Fiscal Year 1980 through Fiscal Year 1989) or until amended, superseded or replaced.

Since implementation in 1979, the Timber Resource Plan has been amended once. In 1984, the Oregon Wilderness Act allocated 9845 acres of previously available commercial forest land to wilderness. In response, the Timber Resource Plan was amended to reflect the necessary change in the land base, as well as in the programmed harvest.

Timber Harvest Levels

Past timber harvest levels have been influenced by the Ochoco National Forest's programmed sale level and by economic conditions. Table 3-23 shows the programmed sale level, the actual sale level, and the actual harvest level for the past twenty years. The much higher actual sale level than programmed sale level in 1970-1974 was due to salvaging of a large blowdown. The much lower cut levels during the 1980's reflects the decline in building and construction related to the recession. The programmed harvest levels represent the regulated volume that can be compared to the allowable sale quantities in Table 2-8, Chapter 2 - Alternatives, Including the Proposed Action.

TABLE 3-23
PAST TIMBER HARVEST LEVELS 1/

Fiscal Year	Programmed Sales	Actual Sales	Actual Cut
1970	131 0	189 4	118 1
1971	131 0	160 2	133 3
1972	131 0	168 7	157 4
1973	131 0	145 7	163 6
1974	131 0	130 3	159 2
1975	131 0	126 2	134 9
1976	131 0	133 4	137 8
Trans Qtr 2/		24 8	34 8
1977	131 0	134 3	143 4
1978	131 0	154 0	146 0
1979	131 0	133 3	90 0
1980	132 7	136 2	84 4
1981	132 7	136 3	83 5
1982	132 7	113 6	42 9
1983	132 7	133 5	97 1
1984	132 7	146 9 3/	134 0
1985	129 8 4/	110 3	162 0
1986	129 8	163 4	149 4
1987	129 8	165 6	146 1
1988	129 8	142 3	127 0

NOTE Programmed Sales include regulated volume only, Actual Sales and Cut includes total volume

1/ Volumes shown are average annual sawlog material in millions of board feet

2/ Transition quarter when start of fiscal year was changed from July to October

3/ This was not adjusted for 273 7 MMBF of turnback volume

4/ This figure was adjusted to 129 8 after passage of the Oregon Wilderness Act of 1984

Economics

Timber sales originating on the Ochoco National Forest have contributed significant amounts of revenue to the Federal Treasury and to local counties (Table 3-24). Gross receipts to the Federal Treasury have varied from 7.3 million dollars (1982) to 28.4 million dollars (1988). The low points in 1982 and 1983 reflect the slowdown in housing construction during the recent recession.

Timber sale costs are shown in Table 3-24. Other than in 1984, annual expenses directly associated with the timber sale program have averaged approximately seven million dollars. The high costs in 1984, resulted from high road construction costs relating to unusual market conditions and timber sale extensions.

Below-Cost Timber Sales

Disregarding 1982, annual receipts from Ochoco National Forest timber sales have been approximately 2 to 3 times larger than timber sale program costs. The relatively low receipts in 1982 were equal to the costs at that time. There are very few sales (less than one percent) on this Forest that return less than the costs ("below cost" sales). Those that do are generally sales for beetle-killed lodgepole pine, other salvage, or special situations such as the removal of hazard trees from campgrounds or administrative sites.

Present Conditions

The classification of Ochoco National Forest lands, in terms of timber production, has changed between this FEIS and the current Timber Resource Plan (1980). These differences reflect changes in multiple resource management objectives that have taken place locally, regionally and nationally during the last 10 years.

Within the Ochoco National Forest, approximately 533,180 acres, or 63 percent of the net National Forest System acres, are available, capable, and

suitable for timber production (see Table 3-25). The remaining 37 percent of these acres fall into one of the categories in Table 3-25.

The 533,180 acres of Ochoco National Forest lands, that are available, capable, and suitable for timber production, have been stratified into three vegetation types: low site ponderosa pine, ponderosa pine, and mixed conifer. The three timber types were defined based on similarities in tree species composition and productivity. Vegetation types represent an aggregation of plant associations. Table 3-26 displays the productivity and acreage in each type. Approximately two thirds of the acreage is occupied by ponderosa pine stands.

TABLE 3-24
TIMBER SALE COSTS AND RECEIPTS
(MILLIONS OF DOLLARS)

Year	Gross 1/ Receipts	Timber Sales Program 2/	Reforestation and TSI	Brush 3/ Disposal	Other Resource Support	Roads 4/	Total Costs
1980	136	11	09	04	01	40	65
1981	192	11	11	04	02	40	68
1982	73	14	09	02	02	46	73
1983	103	14	01	03	02	39	59
1984	199	16	05	02	02	81	106
1985	111	16	05	05	02	06	34
1986	292	12	02	07	01	10	32
1987	248	14	02	10	02	12	40
1988	258	16	01	10	02	12	41

1/ Figures include all collections for K-V, BD, Purchaser Credit, etc
2/ Figures include silvicultural exams, timber sale preparation, and timber sale administration
3/ Figures include the Forest Service portion of the brush disposal (BD) work based on BD collections
4/ Figures include road design, construction, reconstruction, and maintenance from both appropriations and purchaser credit

TABLE 3-25
TENTATIVE TIMBER LAND SUITABILITY 1/

	Forest	Grassland	Total
Total Area within Forest/Grassland Boundary	978,550	173,630	1,152,180
Other Ownership	133,050	62,250	195,300
Net National Forest System (NFS) Acres 2/	845,500	111,380	956,880
Nonforested Acres			
Water	200	0	200
Nonforest (<10% cover) 3/	264,620	111,170	375,780
Other Purposes 4/	8,120	0	8,120
Total Nonforest Acres	272,940	111,170	384,110
Forested Acres			
NFS acres minus nonforest acres	572,560	210	572,770
Deductions			
Withdrawn			
Wilderness	26,520	0	26,520
RNA's	1,730	0	1,730
Other (Forested land on Grassland)	0	210	210
Subtotal	28,250	210	28,460
Lands Growing (20 cu ft /acre/year)			
Unsuitable	8,570	0	8,570
Suitable 12,420			
Regeneration Difficulty	2,560	0	2,560
Total Deductions	39,380	210	39,590
TENTATIVELY SUITABLE TIMBER ACRES (Forested Acres Minus Deductions)	533,180	0	533,180

1/ Figures are from 1984 Tentative Timber Land Suitability table unless otherwise noted
2/ From "Land Areas of the National Forest System as of September 30, 1987," FS-383 Current figures show a net increase of over 6,000 acres in National Forest System lands over 1984 figures
3/ Adjusted from 1984 figures It is assumed here that most of the increase shown in NFS lands was on the National Grassland and was likely nonforest land
4/ Other purposes include administrative sites (464 acres), recreation sites (725 acres), and roads (6,934 acres)

TABLE 3-26
PRODUCTIVITY BY VEGETATION TYPES

Vegetation Type	Site Index 1/ (Base Age 100 Yrs)	Growth 2/ (Cu Ft /Ac /Yr)	Acreage 3/
Low Site Pine	60-70 (PP)	15-23	13,150
Ponderosa Pine	65-75 (PP)	23-58	333,970
Mixed Conifer	70-75 (PP) 70-80 (DF)	33-115	186,060

1/ Site index refers to the average height (in feet) of a tree at a specified age (PP refers to ponderosa pine, Df refers to Douglas-fir)
2/ Productivity is measured here as cubic feet of commercial wood produced per acre per year
3/ Does not include forested lands classified as wilderness or research natural area
Sources: Site index and growth figures are from Hall, 1973 Acreage figures were computed from the 1982 Forest Inventory

TABLE 3-27
STANDING TIMBER VOLUME

Vegetation Type	Big Summit District	Paulina District	Prineville District	Snow Mountain District	TOTAL
Mixed Conifer					
Acres	67 070	55,700	39,170	24,120	186,060
MMCF	212	155	123	66	557
MMBF	1,206	895	694	385	3,180
Ponderosa Pine					
Acres	72,930	56,900	70,570	133,560	333,960
MMCF	123	91	122	206	542
MMBF	671	488	699	1,176	3,034
Ponderosa Pine (Low Site)					
Acres	1,460	1,720	1,870	8,110	13,160
MMCF	1	2	2	8	12
MMBF	8	9	10	43	70
TOTAL					
Acres	141,460	114,320	111,610	165,790	533,180
MMCF	337	248	247	280	1,111
MMBF	1,885	1,392	1,403	1,604	6,284

Source Timber Resource Inventory (1982) volumes projected to 1990 using empirical yield tables Acreages are adjusted for areas under contract at time of inventory and areas sold since the inventory

TABLE 3-28
SIZE CLASSES BY TIMBER TYPE
(Acres)

	Low Site Pine	Ponderosa Pine	Mixed Conifer
Sapling	0	76,450	32,400
Pole	0	26,910	0
Sawtimber	0	70,200	78,670
Two-storied	13,150	160,400	75,000

Ponderosa pine and western juniper dominate the relatively arid low site ponderosa pine type. Ponderosa pine and some Douglas-fir occur in the ponderosa pine type. The mixed conifer type includes ponderosa pine, white fir, Douglas-fir, western larch, Englemann spruce, and lodgepole pine. Quaking aspen is found occasionally in moist areas.

Estimates of vegetation types from the most current (1982) timber inventory are summarized below. Table 3-27 displays existing standing timber volume data, for each of the Forest's four Ranger Districts, in terms of million cubic feet (MMCF) and million board feet (MMBF). The acreage and volume figures shown do not include lands in designated wilderness or research natural areas.

Low site pine types generally occupy a transition area between the ponderosa pine type and nonforested areas. Scattered individual pine trees or clumps are intermingled with juniper, mountain mahogany, and nonforested openings. Generally individual trees are harvested on these types only when sufficient advance reproduction already exists.

One third of the ponderosa pine stands are relatively even-aged. The other two thirds of the ponderosa pine stands are two-storied or multi-storied in structure. These stands have some large old growth ponderosa pine (overstory trees) with younger trees of pine or other species below (understory). The understory is variable in terms of the number and size of the trees and is generally manageable.

Approximately 95 percent of the Forest's mixed conifer stands are mature (over 100 years old) and single- or multi-storied in structure. These stands contain mixtures of ponderosa pine, white fir, Douglas-fir, western larch, and lodgepole pine. Generally, it is not feasible to manage the understory of mixed conifer stands.

The two major timber types (ponderosa pine and mixed conifer) have been subdivided into four categories to reflect the size of the trees present and the approximate age of the stand. The four categories are

Sapling- even-aged stands or plantations with trees not yet large enough for commercial harvest;

Pole- generally even-aged stands capable of providing commercial products, but younger than culmination of mean annual increment (biological rotation age);

Sawtimber- generally even aged stands older than culmination of mean annual increment (biological rotation age); and

Two-storied- two-storied or multi-storied stands containing an overstory of sawtimber sized trees and a definite understory.

These categories are averages, representing a broad range of field conditions. Table 3-28 displays the acreages in each category by timber type.

Tree Improvement Program

The improvement of any species through genetic selection is dependent upon sufficient natural genetic variation. All of the commercial tree species found in the Ochoco National Forest show considerable natural genetic variation. Consequently, these species lend themselves to improvement through a tree improvement program.

In 1975, the original tree improvement plan for the Ochoco National Forest was approved by the Regional Forester. Since that date an active tree improvement program has been in effect. The original tree improvement plan was revised in 1980 and will be revised again in 1989. The tree improvement plan for the Ochoco National Forest covers all of the Ochoco National Forest and that portion of the Burns Ranger District, Malheur National Forest, located in the Silvies-Malheur Breeding Block.

The tree improvement program for the Ochoco National Forest has the following goals:

1. Ensure the application of genetic principles to natural or artificial regeneration systems.
2. Provide improved seedling stock for artificial regeneration (reforestation). This includes:
    a. Selecting a minimum number of superior trees ("select trees" or "parent trees") from wild stands, based on their phenotype or outward appearance, for each commercial species.
    b. Establishing natural stand seed production areas for species in which sufficient seed cannot be collected from select trees.
    c. Establishing mass selection plantations (plantation seed production area established with progeny from select/parent trees) for species placed in low-level programs.
    d. Establishing untested seed orchards for species placed in intermediate-level programs (none are planned at this time).
    e. Establishing tested seed orchards and evaluation plantations for species placed in high-level programs.
3. Develop and maintain a broad genetic base for all species for gene conservation and the preservation of genetic diversity.
4. Develop and implement suitable advanced generation breeding strategies for all tree improvement program intensity levels (low, intermediate, and high).

Since the Ochoco National Forest began its tree improvement program in 1975, 2380 parent trees have been selected from the wild population, and two ponderosa pine seed orchards and 19 ponderosa pine evaluation plantations have been established.

For more detailed information on the tree improvement program for the Ochoco National Forest, see the Tree Improvement Plan. A revision of this plan will be completed in fiscal year 1989.

Vegetation Management

Vegetation is considered undesirable when it hinders the achievement of management objectives. Undesirable vegetation includes grasses, shrubs, and noxious weeds, as well as noncrop tree species. Undesirable vegetation can compete with crop trees for water, nutrients, and light during the early stages of development. This competition can greatly delay the regeneration of desirable forest trees.

The treatment of undesirable vegetation on the Ochoco National Forest and Crooked River National Grassland has included: prescribed fire, manual, mechanical, biological and chemical treatment methods. The use of chemicals, however, has not been available since 1984. In that year, the Pacific Northwest Region of the Forest Service was enjoined from using chemicals for vegetation management until an adequate "worst case analysis" had been prepared. In lieu of a worst case analysis, a Final Environmental Impact Statement has been prepared on Managing Competing and Unwanted Vegetation in the Pacific Northwest Region. The decision of the Regional Forester concerning this FEIS was made on December 8,1988, and includes the use of all tools available for managing competing and unwanted vegetation, including chemicals. After subsequent appeals and mediation through the U.S. District Court in Portland, Oregon, the injunction was lifted on May 24, 1989, by Judge James M. Burns. This decision, however, reflects the Regional Forester's desire to reduce the Pacific Northwest Region's reliance on herbicides, and emphasizes 1) the prevention of vegetation management problems, 2) the preference for the use of non-herbicide methods and 3) that the use of herbicides will require special considerations.

The Ochoco National Forest and Crooked River National Grassland have not used chemicals for the treatment of competing or unwanted vegetation since the injunction issued in 1984, but will maintain options for chemical use under the direction of the final Record of Decision and FEIS for Managing Competing and Unwanted Vegetation in the Pacific Northwest Region

Timber Supply and Demand

Timber Supply and Projections for the Pacific Northwest Region

The principal projections used in developing long-range plans and programs for the management of national forests are contained in the Forest and Rangeland Renewable Resources Planning Act (RPA) Assessment and 1984 Update. These projections focus on the situation for the long-term (50 years), and do not necessarily recognize current short-term regional fluctuations. A summary of those projected RPA trends (year 2030) for timber supplies follows.

Hardwoods

The current balance between growth of wood and its removal shows that the hardwood forests and eastern softwood forests can support additional timber harvests; however, this balance will change, and future harvests, particularly in the decade beyond 2000, could vary over a wide range. Nonetheless, if commercial timberland owners continue to respond to price and inventory changes, timber harvests can be increased substantially in most geographic regions during the next few decades. The largest hardwood increase will be in the South, which is expected to rise from about 3.4 billion cubic feet from 1980 to 9.4 billion cubic feet in 2030 (RPA, 1984).

Softwoods

Total projected softwood roundwood harvests would rise 24 percent from 9.6 billion cubic feet in 1980 to 11.9 billion cubic feet in 2030. Though the outlook is for increased softwood harvests nationally, there are important differences among the major softwood timber producing regions.

In the Douglas-fir subregion, projected annual harvest from 1980 to 1990 is about 2.3 billion cubic feet. It then declines slightly to about two billion cubic feet per year. This level is roughly maintained through the rest of the 50-year projection period (RPA, 1984).

In contrast, the other major source of softwood timber harvest is the South, which is projected to rise from about 4.1 billion cubic feet in 1980 to 7.3 billion cubic feet in 2030. Much of the expansion in the South with softwoods, as well as hardwoods, is due to the fact that its wood products production has become more diversified compared to other regions of the country.

Timber Demand and Projections for the Pacific Northwest Region

Over the next ten years, timber demand from the Pacific Northwest will grow slowly. Although there is a backlog of unfulfilled housing demands, the future will depend primarily on strength in personal income and the availability of affordable housing and financing. In addition, projections of exports to the Pacific Rim countries show a continuing slow economic growth. The analysis acknowledges there will be a declining trend in the construction sector. Structure replacement, rather than new construction, will characterize the market. The projections for increases in demand may be described as considerably restrained and cautious (Nomura, 1981).

The long-term outlook for the solid wood products industries contains a number of challenges. Evaluation of recent data and information indicates that the demand for timber is changing to a moderate rate of increase as compared to the slowdown that occurred in the early 1980's.

The ability to sustain this increase on a long-run basis is linked to the critical issue of costs. The short-term future of timber and wood products demand is clouded by factors such as the severity and length of the housing and wood products recession that began in 1980. The long-term trends in wood, availability of wood substitutes, and a shift in business management strategies and methods, all contribute to a potential shift in future demand (Haynes and Adams, 1985).

Wood supply will continue to be an issue in the sense that it will be highly dependent on the ability of producers to lower costs to be competitive with wood substitutes (Schallau, 1986).

Although overall current timber supply levels in the Pacific Northwest Region may be capable of meeting future demand, there are some problems within the subregional market areas. This needs to be recognized in terms of a shifting of industry within the

region, and also in the shifting emphasis on the types of wood products produces, as well as the ability of the subregion to supply the various kinds of wood needed.

With a new vision for the future and a concerted effort by the wood products industry to broaden the economic base, the Pacific Northwest could, in time, regain much of the previous strength of one of its larger revenue-generating, basic industries.

A broader vision of the future that includes developing a flexible regional basis for stabilizing wood supplies and applies to forward-looking perspective on wood fiber management, will also allow the Pacific Northwest Region to increase exports to international markets. To achieve this, the forest products industry will need to learn the workings of a different market system and provide more products in the form demanded (Campbell, 1983). In addition, actions by industry, such as modernizing facilities, adopting state-of-the-art technology, reducing costs, and diversifying into other sectors of production (similar to what the southern region has done) could help to rebuild and stabilize the wood-based sectors of the region (Schallau, 1985).

Supply of Timber from the National and International Perspective

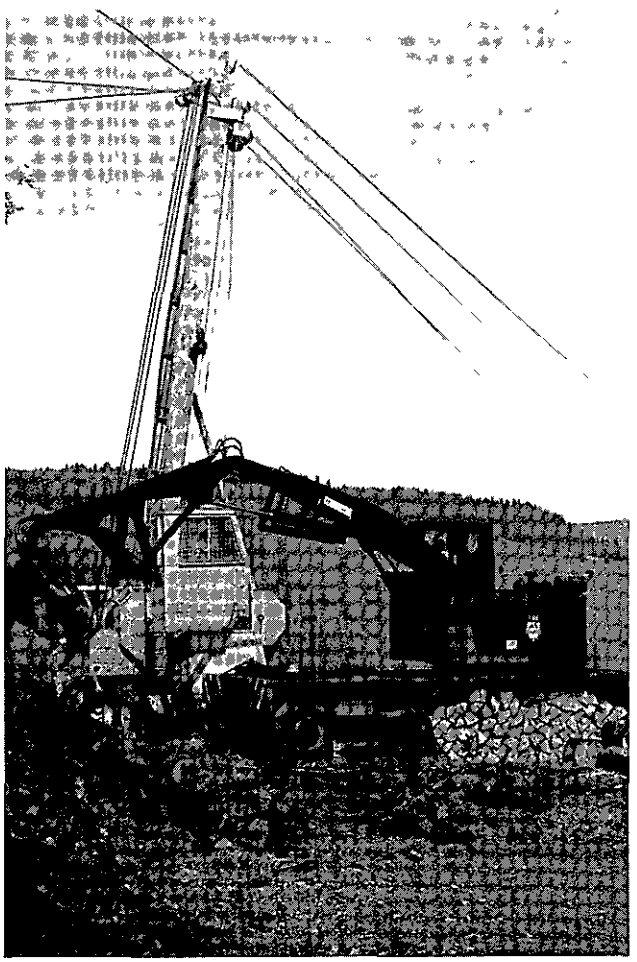
Currently, part of the timber formerly supplied by the Pacific Northwest Region is being supplied by the South and Canada. However, the supply situation from these other sources can change in as little as six years or certainly within 15 years. The projected change indicates a drop in supply capability of 30 to 50 percent from the current relatively high levels. The South should be able to maintain or show a slow increase in harvest because of its remaining inventory and some substitution of hardwoods. However, both the economic and physical supply of softwoods from that area may begin to show decline by the year 2030.

At about the same time, this drop in supply capability begins to occur for the other sources, the growth of wood fiber on private lands in the Pacific Northwest could then become a major source of supply for softwoods to meet national and international demand. Further, during the period before the private lands in the region regain their full supply potential, the public forest would be viewed as a major, relatively stable, supply of wood fiber (Schallau, 1985).

Local Timber Supply

To put the timber supply potential of the Ochoco National Forest in the context of its relationship to the Oregon timber industry in the six county general zone of influence, it is necessary to consider the timber supply picture of the area as a whole.

Historically, the Ochoco National Forest has supplied an average of 127 MMBF of timber per year - 21 percent of the total timber harvested from lands in the six county general zone of influence. This percentage has been relatively stable over the last two decades with the exception of one year where the closure of a mill caused defaulting of timber sale contracts. Because of this long-term stability, it is



assumed that this supply picture will continue into the future. Table 3-29 summarizes the timber harvested, by ownership, from lands in the six county general zone of influence.

Currently, the timber volume marketed from the Ochoco National Forest comes from natural stands, many of which have succeeded to white fir and Douglas-fir. The silvicultural objective of the harvest is to create and even-aged stands. Consequently, three categories of logs are available to mills: 1) large ponderosa pine (greater or equal to 20 inches); 2) small ponderosa pine (less than 20 inches), and 3) small white fir and Douglas-fir.

In the long-run, with conversion to a managed forest, both the large ponderosa pine and the small white fir and Douglas-fir components will be decreasing. At this time, the supply of timber will be more uniform in quality than is currently available.

The three major influences on the potential supply of timber from the Ochoco National Forest are: 1) the number of acres available for harvest; 2) the harvest flow schedule (nondeclining even-flow, or some departure from even-flow) and 3) the intensity of management on those acres. The acreage available is important, because the standing timber volume available for harvest is directly related to acreage. Departure from nondeclining even-flow can temporarily increase harvest levels, but also results in a decrease in harvest levels sometime in the future. Management intensity will have the greatest influence on potential supply levels on the Ochoco National Forest, because it affects the growth rate of trees. The future timber supply outputs for the Ochoco National Forest and the associated environmental consequences of these outputs are discussed by alternative in Chapters 2 and 4, respectively, of this document.

Local Timber Demand

Timber demand has been assessed for the Forest through the 1980 Renewable Resources Planning Act (RPA) and the State of Oregon Forestry Program. The Forest Service's Pacific Northwest Region has distributed the 1980 RPA program goals to the 19 Forests in the Region. The Ochoco National Forest was assigned a goal of 25 million cubic feet (150 million board feet) to be sold annually for the next 50 years.

The Ochoco's share of the Forestry Program for Oregon as identified by the State, increases over time as shown in Table 3-30.

Current programmed sale levels are estimated to be approximately 21 million cubic feet annually.

The demand for Ochoco National Forest timber is confined to the six county zone of general influence. Very few logs leave this immediate area for primary processing. Excluding Deschutes County, few logs are imported to the rest of the zone of general influence for primary processing. This situation may change if timber supply is curtailed to mills in western Oregon.

During the 1980's, adjustments were made in the milling sector of the economy to adjust for the local supply shortage. One mill closed in 1982, and others were retooled to more efficiently handle the smaller timber that is more commonly available. Currently, it is estimated that the primary processing industry is operating at 78 percent capacity. Approximately, one third of the milling capacity is now designed to handle small wood.

Within the zone of general influence, mills range in their dependence on the Ochoco National Forest timber from about 20 to 95 percent. Typically the mills designed to handle large pine logs are the most dependent on timber from public lands.

The relatively high values returned from past timber sales on the Ochoco are a result of the competitive pressures exerted through bidding on timber sales. Stumpage prices received for old growth ponderosa pine have commonly ranged from $100 to $300 per thousand board feet. Nearly every sale offered has been bid on by two or more purchasers pushing prices significantly higher than those appraised (overbid). This suggests that the demand for increased offerings of timber volume is present and is likely to continue, provided economic conditions permit profitable product conversion.

TABLE 3-29
Volume Timber Harvested
in the General Zone of Influence 1/
(Million Board Feet)

	Public Ownership 2/				Private Ownership 2/			
Year	Ochoco NF	Other National Forests 3/	Other 4/	Subtotal	Forest Industry	Other 5/	Subtotal	Total
1970	118	340	44	502	99	28	127	629
1971	133	384	44	561	50	17	67	628
1972	157	390	7	554	66	26	92	646
1973	164	445	9	618	50	25	75	693
1974	160	399	4	563	83	44	127	690
1975	135	345	4	484	82	49	131	615
1976	138	396	7	541	104	19	123	664
1977	143	386	15	544	28	34	62	606
1978	146	376	21	543	35	17	52	595
1979	90	295	47	432	43	13	56	488
1980	84	227	14	325	49	12	61	386
1981	84	227	29	340	47	7	54	394
1982	43	256	42	341	107	5	112	453
1983	97	372	49	518	25	13	38	556
1984	134	445	29	608	22	11	33	641
1985	162	504	38	704	25	9	34	738
1986	149	497	51	697	40	42	82	779
1987	146	322	46	514	44	54	98	612
Total	2,283	6,606	500	9,389	999	425	1,424	10,813
Average	127	367	28	522	55	24	79	601

1/ Sources A) Gedney, et al (in print) Timber Resource statistics for all forest land, except National Forests, in eastern Oregon Pacific Northwest Research Station, Forest Sciences Laboratory, Portland, OR 34p

B) National Forest Inventory Statistics

2/ Crook, Deschutes, Grant, Harney, Jefferson, and Wheeler counties

3/ Deschutes and Malheur National Forest lands

4/ Bureau of Land Management, Native American, Other Federal, State of Oregon, County, and Municipal lands

5/ Farmer and other miscellaneous lands

TABLE 3-30
THE OCHOCO NATIONAL FOREST PORTION OF
THE FORESTRY PROGRAM FOR OREGON
(Million Cubic Feet/Year)

1980	1990	2000	2010	2020	2030	2040	2050	2060	2070
21 00	18 96	19 44	19 74	20 60	21 64	22 31	22 59	22 59	22 94

Transportation

A transportation system is vital to the management and use of the Ochoco National Forest and Crooked River National Grassland. Although primarily constructed to facilitate timber harvest, the existing transportation system also aids other land and resource management by providing access for recreation, reforestation, firewood gathering, range management, minerals exploration, and most other activities. Road related recreation (camping, picnicking, and hunting) accounts for 90 percent of the Forest and Grassland's recreational use. Roads are also important for fire protection.

Existing Condition

In 1989, the transportation system on the Ochoco National Forest and Crooked River National Grassland consisted of 4554 miles of roads that are interconnected with the county, state, and federal road systems. Functional classification of forest roads are arterial, collector, and local roads. Arterial roads are primary roads that provide main access into the Ochoco National Forest and Crooked River National Grassland. Collector roads are secondary roads accessing smaller land areas, and generally provide linkage between arterial, public, or other collector roads. Local roads serve as the terminal roads or provide minor linkage with other roads. The entire transportation system on the Ochoco National Forest and Crooked River National Grassland can be found in the publication "Ochoco National Forest Road Atlas." This publication is available at the Forest Supervisor's Office in Prineville.

Since the transportation system on the Ochoco National Forest has been developed primarily to support timber and range management activities, its development has been concentrated on the more gentle south slopes found on the southern portions of the Ochoco National Forest. This part of the Ochoco National Forest (approximately two-thirds of the total area) has the transportation system needed to provide access for most present and future management activities. There are an average of 4.1 miles of existing road for each square mile in developed areas. The northern one-third of the Ochoco National Forest has a less extensive transportation system and has more difficult terrain for road construction. Most of the roadless area on the Ochoco National Forest occurs here. Roads occupy about one percent of the total land area.

Primary access to the Crooked River National Grassland is provided by state highways and county roads. These roads are suitable for passenger car use. The remainder of the transportation system on the Grassland is composed of roads constructed by previous land owners (prior to 1960, the area was composed of homesteaded lands). These roads were designated as Public Usage Roads by Jefferson County. Under this designation, the county assures that the roads remain open to public use. However, the roads are to be maintained by the public that uses them. Under terms of a cooperative agreement with Jefferson County, the Forest Service maintains approximately 84 miles of these roads for public and administrative use. These roads are normally suitable only for high clearance vehicle use and are impassable or closed seasonally during wet weather. The Grassland has more roads than are necessary for management, but the Public Usage designation prohibits closure. The open, flat terrain generally makes road closure ineffective. Approximately nine percent of the National Grassland has been identified as roadless.

Road Standards

Approximately 910 miles, or 20 percent of the total road system, are arterial and collector roads that are maintained and generally considered safe for passenger car travel at speeds less than 25 miles per hour. The remaining 3644 miles (80 percent) of roads are local roads that are designated as high clearance access roads. Examples of high clearance vehicles include pickups and all purpose vehicles.

Roads under the jurisdiction of the Ochoco National Forest and the Crooked River National Grassland are designated as "development roads." These

roads are not classified as public roads, and for this reason, the Forest and Grassland have the authority to regulate or restrict their use. Consequently, approximately 11 percent of the total road system, is closed on either a long-term or seasonal basis for the protection of other resources.

Until recently, most roads were constructed to relatively high standards. This was done to avoid traffic management problems, extend the log hauling season, and avoid road damage during wet weather. Economic pressures combined with more vigorous analysis has led the Ochoco National Forest to use lower standard roads, in many cases, than may have been used in the past. This change necessitates more active traffic management by the Ochoco National Forest, including temporary delays, seasonal road closures, and detours.

Expected Development

Use of the road systems on the Ochoco National Forest and Crooked River National Grassland is expected to increase. Continued use of the system is closely tied to the level of future management activities and recreational use. Most future road construction will likely take place on the northern slopes of the Ochoco National Forest where costs are expected to be higher than the historic average

Unroaded Areas

In response to the Wilderness Act of 1964, the Forest Service initiated the first Roadless Area Review and Evaluation (RARE) in 1972, to identify study areas for possible inclusion in the National Wilderness Preservation System. An "unroaded area" is defined as an area exclusive of improved roads constructed or maintained for travel by means of motorized vehicles intended for highway use. RARE identified nine roadless areas totaling 115,705 acres on the Ochoco National Forest and Crooked River National Grassland.

The findings of the first RARE had not been acted upon when, in 1977, the Forest Service began a second study known as "RARE II." The first phase of RARE II was to identify areas suitable for wilderness status, not to decide whether such areas would be designated as such. The second phase was to recommend which unroaded areas should be allocated for wilderness or other designations, which for multiple use, and which for further study.

On the Ochoco National Forest and Crooked River National Grassland, RARE II, completed in 1979, designated one roadless area comprising 10,000 acres in the inventory of unroaded areas. Of those inventoried acres, a total of 108,547 acres actually met the roadless criteria. Table 3-31 displays the roadless areas identified under RARE II and their current status.

Approximately 93,110 acres on the Ochoco National Forest and Crooked River National Grassland remain unroaded. This remaining unroaded area includes 36,200 acres in three officially designated wilderness areas, 4030 acres managed as wild and scenic rivers, and 52,880 acres unclassified. Much of this area contains steep slopes, erosive soils, low value timber stands, and/or represents places in which it is difficult to construct roads. The unclassified acreage of unroaded area is contained in six separate unroaded areas: Green Mountain, Lookout Mountain, Rock Creek, Cottonwood, Silver Creek and Deschutes Canyon-Steelhead Falls. These unroaded areas are described briefly here, and in detail in Appendix C.

Green Mountain

This unroaded area contains terrain that is more rugged than most of the Ochoco National Forest, but is otherwise fairly typical. The southern portion of the area consists of ponderosa pine stands interspersed with nontimbered openings. The remaining area contains dense mixed conifer stands. The Green Mountain Trail serves the primary recreation use of the area, i.e. off-road vehicle use and hunting. Current direction for the area is to provide high quality big game habitat and to manage for timber production.

Lookout Mountain

This unroaded area contains sub-alpine and alpine type plant communities interspersed with large openings. The large, open plateau at the top of the mountain is unique to the Ochoco National Forest and visible from U.S. Highway 26. The majority of the timbered slopes contain mixed conifer stands, but pure lodgepole and ponderosa pine stands also occur in the area. Lookout Mountain is popular for big game hunting, snowmobiling, cross country skiing, hiking, and horseback riding. As a part of the deliberations leading to passage of the Oregon Wilderness Act of 1984, the Senate Committee on Energy and Natural Resources recommended that the Forest Service "examine the feasibility of continuing the current use in the National Forest Plan and determine the land allocation in the Forest Plan." Current direction is to emphasize recreational values and maintain the character of the forest over time, without permanent removal of this area from timber production.

Rock Creek

This unroaded area contains deep canyons, 800 to 1000 feet in depth, and consequently, represents one of the most rugged areas on the Ochoco National Forest. The upper portions of the area are primarily open ridge tops and talus slopes. Timbered stands contain old growth mixed conifer. Diverse habitats in the area support a variety of wildlife, including wintering bald eagles, and possibly wolverines. Primary use of the area is for hunting and fishing. Current direction is to provide high quality big game habitat and to manage for timber production.

Cottonwood

This unroaded area contains ridges and canyons which form a steep, deeply dissected landscape. Stream bottoms and north-facing slopes are densely covered with mixed conifer timber stands, while southerly aspects contain open ponderosa pine stands and natural openings. Diverse wildlife habitats are believed to support black bear, wolverines, and mountain lions. Hunting and fishing are the primary recreational uses. Current direction is to provide high quality big game habitat, and to manage for timber production.

Silver Creek

This unroaded area is a shallow canyon area with a basalt outcrop around the canyon rim. It features old growth ponderosa pine stands and scattered small openings, which make it unique in that all other unroaded areas on the Ochoco National Forest are dominated by mixed conifer stands. This area is also the only roadless area on the south end of the Ochoco National Forest (Snow Mountain District). Portions of a proposed Research Natural Area lie in Silver Creek. Primary recreational uses are hunting and fishing. The main canyon area (approximately 3300 acres) is currently managed as a roadless area. Current direction for the surrounding upland area is to develop it for timber production.

Deschutes Canyon-Steelhead Falls

This unroaded area is unique from several standpoints. It contains deep, sheer canyons along the Deschutes River and Squaw Creek which support productive riparian areas and fish habitat. Pockets of ponderosa pine and juniper occur in the narrow stream bottoms. The surrounding plateau area contains juniper, sagebrush, bitterbrush, and grasses. It is the only unroaded area on the Crooked River National Grassland. The area is popular for fishing, hunting, and sightseeing. The Deschutes Canyon-Steelhead Falls unroaded area was placed in the "Further Study" category by RARE II; for this reason the Oregon Wilderness Act of 1984 directed that this area be studied for potential wilderness designation through the forest planning process.

The Oregon Wilderness Act of 1984 released all of these unroaded areas except the Deschutes Canyon-Steelhead Falls area from being considered for wilderness in this plan. These areas are to be managed for multiple use in accordance with current land management plans, and not necessarily for

protection of wilderness suitability. Recommendations concerning the future management of these unroaded areas, including the Deschutes Canyon-Steelhead Falls area, are presented in the alternatives described in Chapter 2.

Figure 3-14 displays the general location of the remaining unroaded areas on the Ochoco National Forest and Crooked River National Grassland, and Table 3-32 shows the size and estimated recreational use capacity of each area.

TABLE 3-31
UNROADED AREA SUMMARY

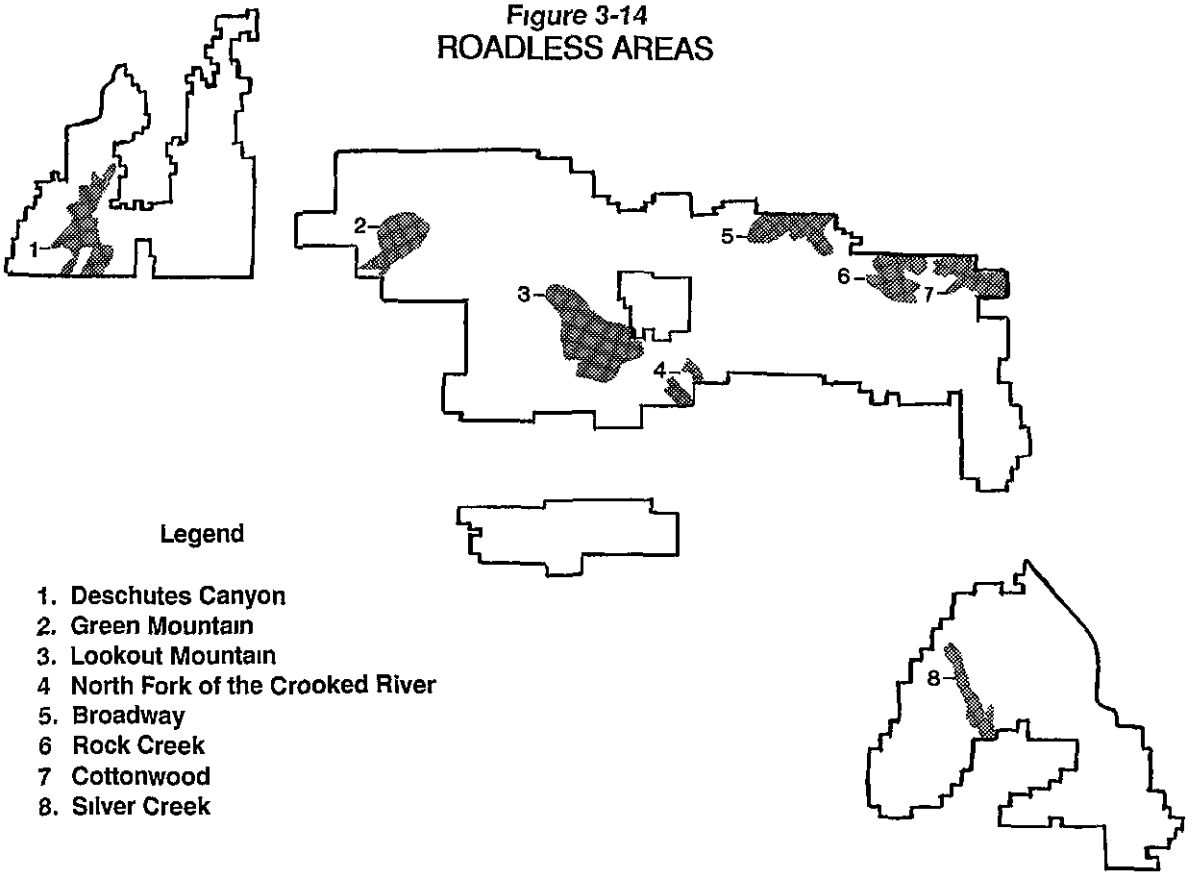
UNROADED Area	Original (RARE II) Acres	Current Acres	Reason for Acreage Change
Black Canyon	13,200	0	Wilderness established by PL 98-328
Bridge Creek	5,500	0	Wilderness established by PL 98-328
Broadway	8,650	0	Timber harvest and road construction
Cottonwood	11,051	9,780	More accurate mapping and inventory
Deschutes Canyon-Steelhead Falls	10,000	7,840	2,000 established as scenic river by the Oregon Rivers Bill
Green Mountain	6,630	6,630	
Lookout Mountain	15,260	14,270	More accurate mapping and inventory
Mill Creek	17,300	0	Wilderness established by PL 98-328
Rock Creek	9,286	11,410	More accurate mapping and inventory
Silver Creek	11,670	7,460	Timber harvest and road construction
Total	108,547	57,390	

TABLE 3-32
REMAINING UNROADED AREAS
SIZE AND CAPACITY

Unroaded Area	Criteria Acres	Recreation Visitor Days/Yr	Location
Green Mountain	6,630	7,000	Prineville Ranger District
Lookout Mountain	14,270	16,300	Big Summit Ranger District
Rock Creek	11,410	12,400	Paulina Ranger District
Cottonwood	9,780	12,700	Paulina Ranger District
Silver Creek	7,460	2,400	Snow Mountain Ranger District
Deschutes Canyon-Steelhead Falls 1/	10,000	2,600	Crooked River National Grassland
Total	59,550	51,400	

1/ Includes area designated as wild and scenic river

Figure 3-14
ROADLESS AREAS



Water

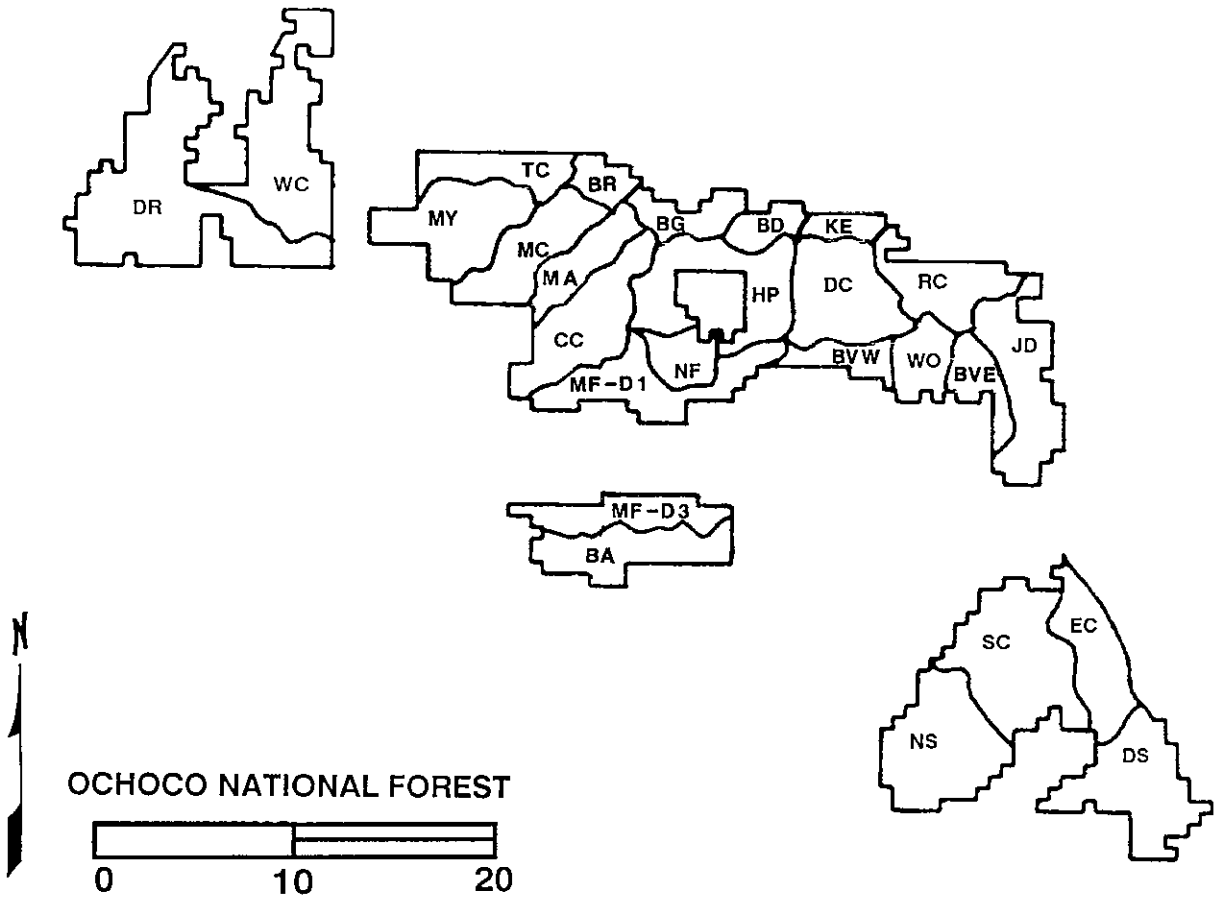
Watersheds on the Ochoco National Forest and Crooked River National Grassland are characterized by relatively low precipitation and humidity, rapid evaporation, abundant sunshine, and wide monthly and daily ranges in temperature. Mean annual precipitation on the Forest is 21 inches with a range from 11 inches at lower elevations to 33 inches at the highest elevations. Precipitation on the Grassland averages 10.5 inches and ranges from 7 to 19 inches. Most of this precipitation occurs between October and June, and over half falls as snow.

The average annual precipitation for all watersheds on the Ochoco National Forest yields approximately 574,000 acre feet of runoff. More than 80 percent of this runoff occurs during the months of February through May, with 35 percent occurring in April alone. Streamflow on the Forest is lowest during September. Runoff from the Crooked River National Grassland is minimal, except for major storm events. Surface flow in streams and rivers on the Crooked River National Grassland largely results from runoff originating outside the Grassland boundary, or from ground water.

Most Ochoco National Forest streams drain into the Crooked River, a tributary of the Deschutes River. The north slopes of the Big Summit and Paulina Ranger Districts, and the east slopes of the Paulina Ranger District, empty into the John Day River. The majority of runoff from the Snow Mountain Ranger District flows into the Malheur/Harney Lakes basin, which has no surface outlet. The watersheds of the Crooked River National Grassland drain into the Deschutes River directly, or via the Crooked River. Figure 3-15 depicts the locations of the watersheds on the Ochoco National Forest and Crooked River National Grassland.

Figure 3-15

WATERSHEDS ON THE FOREST AND GRASSLAND



CROOKED RIVER
Bear Camp (BA)
Beaver Creek (East) (BVE)
Beaver Creek (West) (BVW)
Deep Creek (DC)
Howard-Porter (HP)
Marks Creek (MA)
McKay Creek (MY)
Middle Fork (MF-D1)
Middle Fork (MF-D3)
Mill Creek (MC)
North Fork (NF)
Ochoco Creek (OC)
Wolf Creek (WO)

DESCHUTES RIVER
Deschutes River (DR)
Trout Creek (TC)
Willow Creek (WC)

JOHN DAY RIVER
Bear Creek (BR)
Bridge Creek (BG)
Badger Creek (BD)
Rock Creek (RC)
Keeton Creek (KE)
John Day Tributaries (JD)

MALHEUR-HARNEY LAKES
Dry-Stinger (DS)
Emigrant Creek (EC)
Nicol-Sawmill (NS)
Silver Creek (SC)

Watershed Conditions

Watershed conditions on the Forest and Grassland range from undisturbed to deteriorated. The cause of deterioration is linked to human activities which have taken place over the last 150 years. Beaver trapping and timber harvest in riparian areas have reduced the stream's ability to capture sediment and to slow runoff. Roads and skid trails constructed adjacent to streams have concentrated runoff, accelerating bank erosion and downcutting. Livestock concentration near streams has damaged bank vegetation, increased mass wasting of upper banks, and degraded water quality. Many streams experience increased stream temperatures and sedimentation from these activities. After several decades of these types of impacts, the natural ability of some watersheds to recover and to return to a stable condition has been reduced. Problems associated with damaged streambanks are compounded by the occurrence of a major storm event.

The water quality in most streams meets applicable State Water Quality Standards most of the time. However, approximately 50 percent of the total miles of streams on the Ochoco National Forest are in a degraded condition. Streams in poor condition have seasonal problems with turbidity and/or temperature. On-going and future management activities are designed to upgrade these streams to excellent condition; however, full recovery of all currently degraded streams will probably not be achieved for several decades.

Physical stream surveys have been conducted on most of the perennial streams on the Ochoco National Forest and Crooked River National Grassland. The existing stream conditions have been classified as acceptable or unacceptable. Streams in acceptable condition have at least 80 percent of the banks in stable condition, and a minimum of 80 percent shade, or 100 percent of the potential shade.

A summary of stream conditions on the Ochoco National Forest and Crooked River National Grassland is displayed in Table 3-33.

TABLE 3-33
STREAM CONDITIONS
(Miles)

Ranger District	Acceptable	Unacceptable
Crooked River National Grassland	11 3	20 4
Prineville	86 8	85 2
Big Summit	109 0	106 3
Paulina	139 5	67 0
Snow Mountain	69 3	122 8
Total	415 9	401 7

Cumulative Effects/Major Storm Events

Cumulative effects of past and present land management practices have contributed to the unacceptable condition of many Forest watersheds These "cumulative effects" have the potential to result in degraded water quality or stream habitat conditions. The risk is highest when a watershed that has been made more hydrologically sensitive experiences a major storm event.

In order to monitor these cumulative effects and to provide an assessment of risk, a watershed sensitivity rating system has been developed. This system indicates the relative risk of a watershed not meeting water quality goals when developed for timber or range management. Each of the 26 major watersheds on the Ochoco National Forest and Crooked

River National Grassland have been assigned a sensitivity rating of low, medium or high. Criteria used to develop the watershed sensitivity rating include soil depth, compaction hazard, road density, slope, fisheries value, and existing and potential riparian condition.

Each watershed has also been assigned a "threshold value." The threshold value identifies the upper limit of timber harvest without incurring significant damage from a major storm event. The threshold value is a reflection of the watershed sensitivity, with low thresholds indicating high sensitivity. Table 3-34 displays the sensitivity ratings and threshold values assigned to each of the 26 major watersheds on the Ochoco National Forest and the Crooked River National Grassland.

TABLE 3-34
WATERSHED SENSITIVITIES AND THRESHOLD VALUES

Watershed	Sensitivity	Threshold Value
Middle Fork Crooked River (D-1)	Low	35 percent
Middle Fork Crooked River (D-3)	"	"
Dry Stinger Creek	"	"
Beaver Creek (East)	"	"
Beaver Creek (West)	"	"
Bear/Camp Creek	"	"
North Fork Crooked River	Medium	30 percent
Marks Creek	"	"
Emigrant Creek	"	"
McKay Creek	"	"
Howard/Porter Creek	"	"
Ochoco Creek	"	"
Mill Creek	"	"
Silver Creek	"	"
Deschutes River	"	"
Willow Creek	"	"
John Day River (tributaries)	High	25 percent
Rock Creek	"	"
Trout Creek	"	"
Bridge Creek	"	"
Deep Creek	"	"
Wolf Creek	"	"
Nicoll/Sawmill Creek	"	"
Badger Creek	"	"
Bear Creek	"	"

On watersheds where project scoping identifies an issue or concern regarding the cumulative effects of activities on water quality or stream channels, a cumulative effects assessment is made. This includes land in all ownerships in the watershed. Activities on National Forest System lands in these watersheds will be dispersed in time and space at least to the extent necessary to meet minimum management requirements. On intermingled ownerships, scheduling efforts will be coordinated.

Stream Dynamics and Potential Impacts

The frequency and magnitude of storm events has a major effect on the character of drainages. Frequent storm events of low magnitude (less than one year return period) carry so little energy that the affect on a drainage is small. Large storm events (100 year return period) are so rare that, although their immediate effect is great, their long-term impact is only moderate. It is the intermediate events (5-25 year return period) which exhibit both sufficient energy and frequency to exert a major impact on channel morphology.

The majority of stable channels on the Forest are defined by the two year average annual flow. Flows greater than the two year event overflow the natural banks and inundate the flood plain. With bank overflow, flow velocities decrease markedly and sediment in transport is deposited, building floodplains and increasing soil fertility.

When the stream channel becomes incised, flow events greater than the two year return period are contained within the main channel. These larger magnitude flow events result in a greater amount of energy being released within the channel. The result is a continued excavation of channel bottom and banks, lowering of the floodplain water table, and destruction of fish habitat through pool filling and streamed gravel cementation.

Livestock grazing, timber harvest, and road construction can adversely impact stream systems. These activities can decrease evapotranspiration, increase snowpack, raise stream temperature, compact the soil, and create water repellent soil layers. These potential effects can be mitigated through the use of Standards and Guidelines (Appendix D) and Best Management Practices (BMP's). Effects on resources will need to be monitored.

Water quality criteria have been established by the State of Oregon under direction of the Clean Water Act. Water quality goals for streams are set on an individual project basis to meet these criteria. During environmental analysis, an Interdisciplinary Team (IDT) will select appropriate BMP's that are designed to protect the water resource. These selected BMP's are used in the preparation of the timber sale contract or other project plan. Individual projects are then monitored to determine whether or not the selected BMP's contribute to meeting the established water quality goals.

Riparian Areas, Floodplains, and Wetlands

Riparian Areas

Riparian areas are associated with streams, springs, lakes and other bodies of water. They are sensitive to land use activities and require special attention. Conservation and protection of riparian areas is a national concern.

Maintaining the integrity of riparian areas is essential to the maintenance of water quality. In addition to providing stream bank stability, riparian communities serve as filter strips to prevent sedimentation from remote non-point sources of erosion. They also serve as a source of woody material which stabilizes streambanks, and provides nutrients to the stream ecosystem.

Riparian areas and their associated water resource are a focal point for recreation, including fishing, camping, boating, hiking, and hunting. In addition, many wildlife species are dependent on this diverse habitat for food, cover, and water. Of the 378 terrestrial wildlife species found in the Blue Mountains, 285 are dependent upon or use riparian habitat more than any other ecosystem. (Thomas, 1979). Perennial streams usually support trout and other species of fish. The riparian vegetation is of critical importance for escape cover, stream shade, and streambank stability in order to maintain water quality and aquatic habitat for trout and other cold water fish species.

Floodplains

As defined in Executive Order 11988, floodplains are those areas subject to a one percent (100-year recurrence) or greater chance of flooding in any given year, and need to remain unmodified so they can pass floods safely. Because of the terrain found on the Ochoco National Forest and Crooked River National Grassland, floodplains are located within riparian areas and are generally contained within 100 feet of stream banks. Roads, road crossings, campgrounds, grazing and timber harvest are the primary causes of impacts to floodplains on the Ochoco National Forest and the Crooked River National Grassland.

Figure 3-16

RIPARIAN ANALYSIS

PRINEVILLE

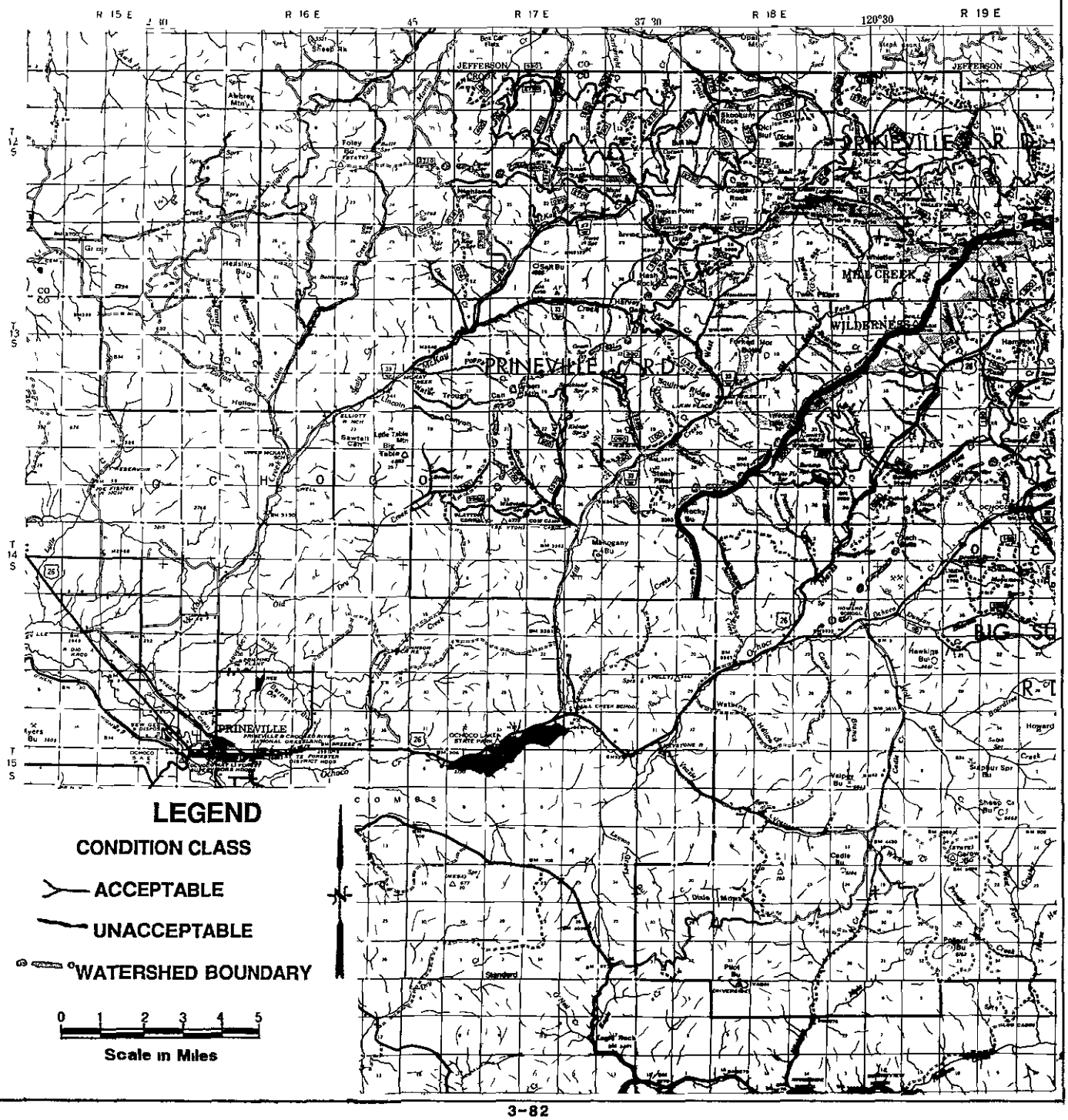


Figure 3-17

RIPARIAN ANALYSIS

PRINEVILLE (MAURYS)

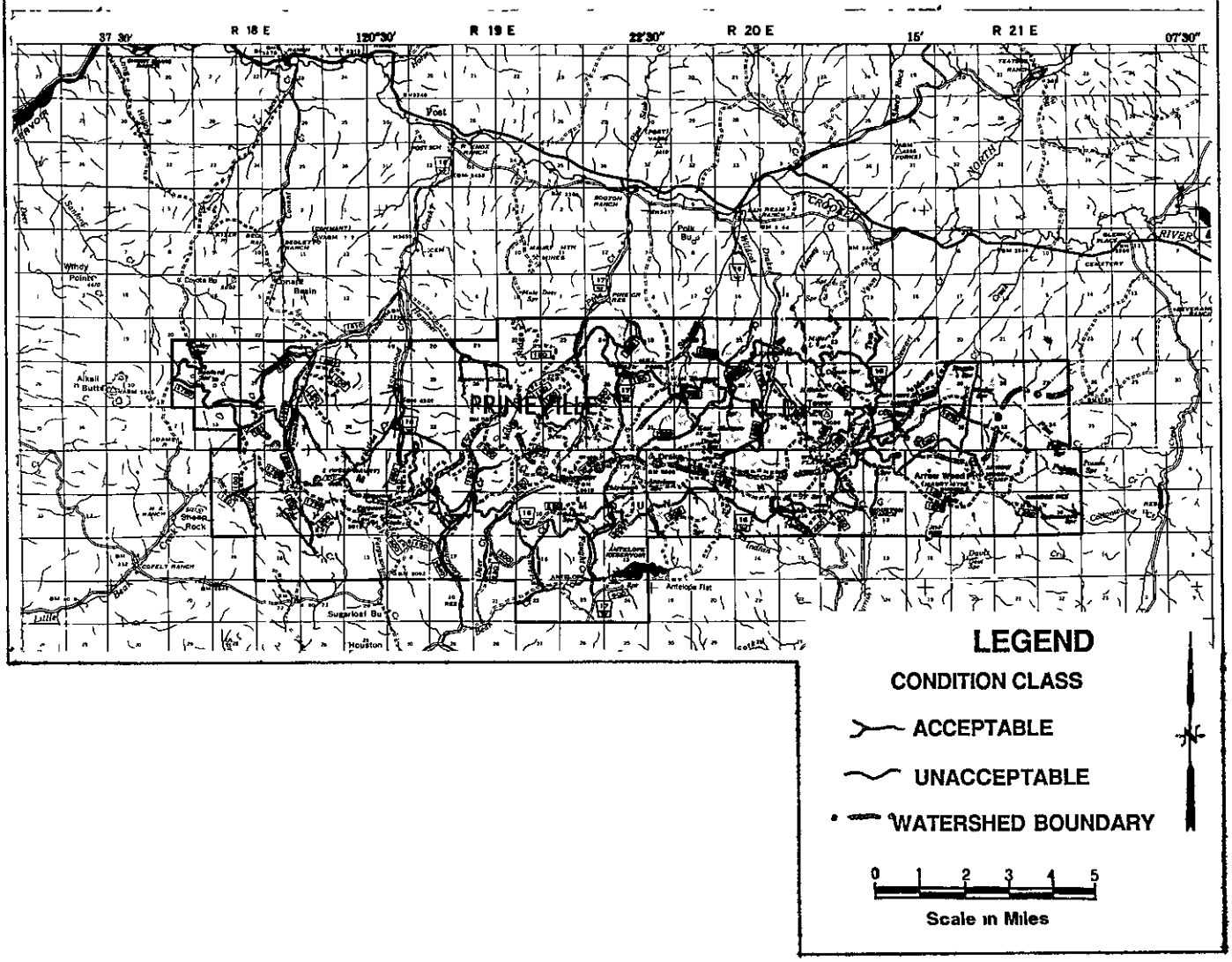


Figure 3-18

RIPARIAN ANALYSIS

BIG SUMMIT

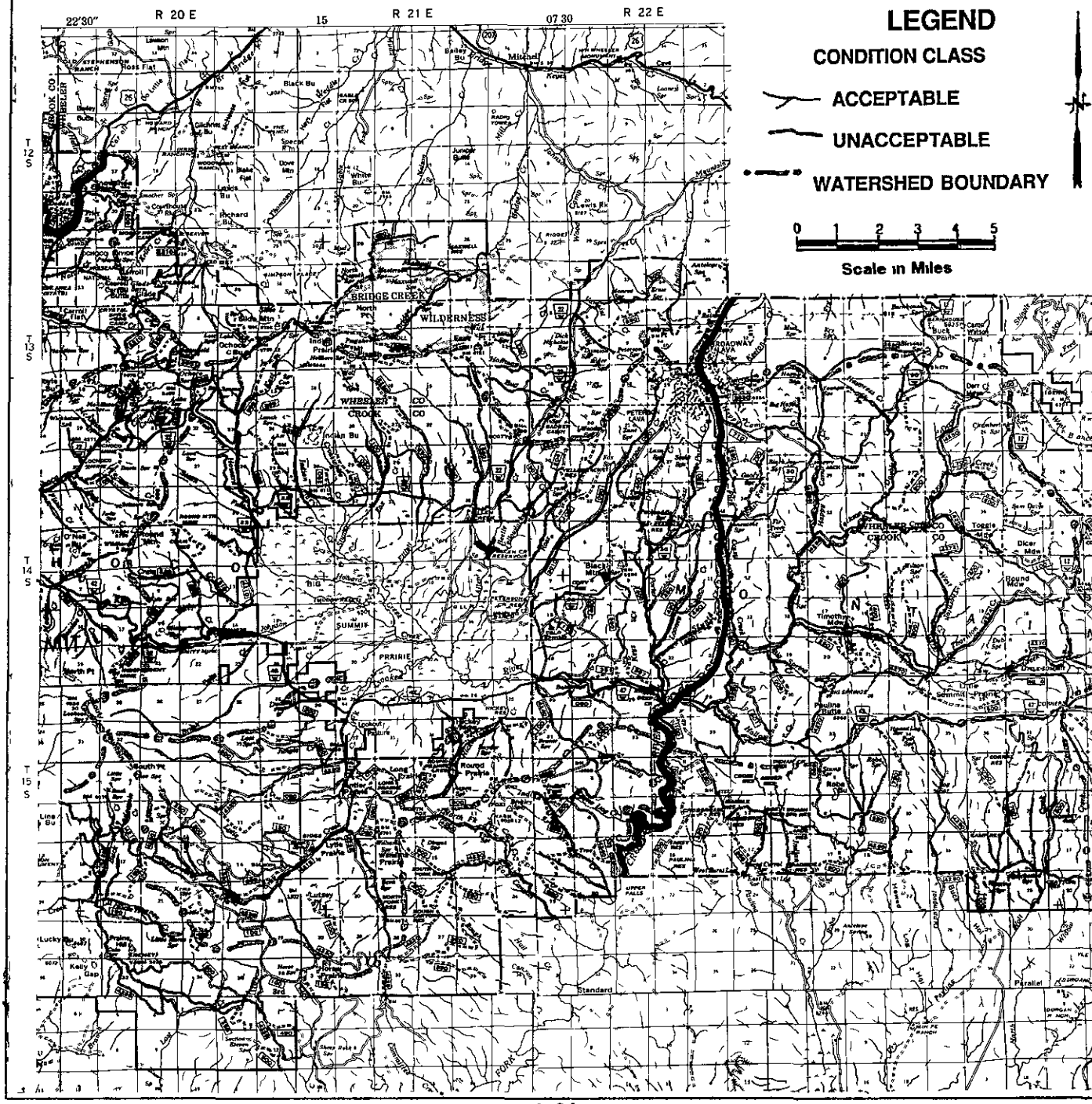


Figure 3-19

RIPARIAN ANALYSIS

PAULINA

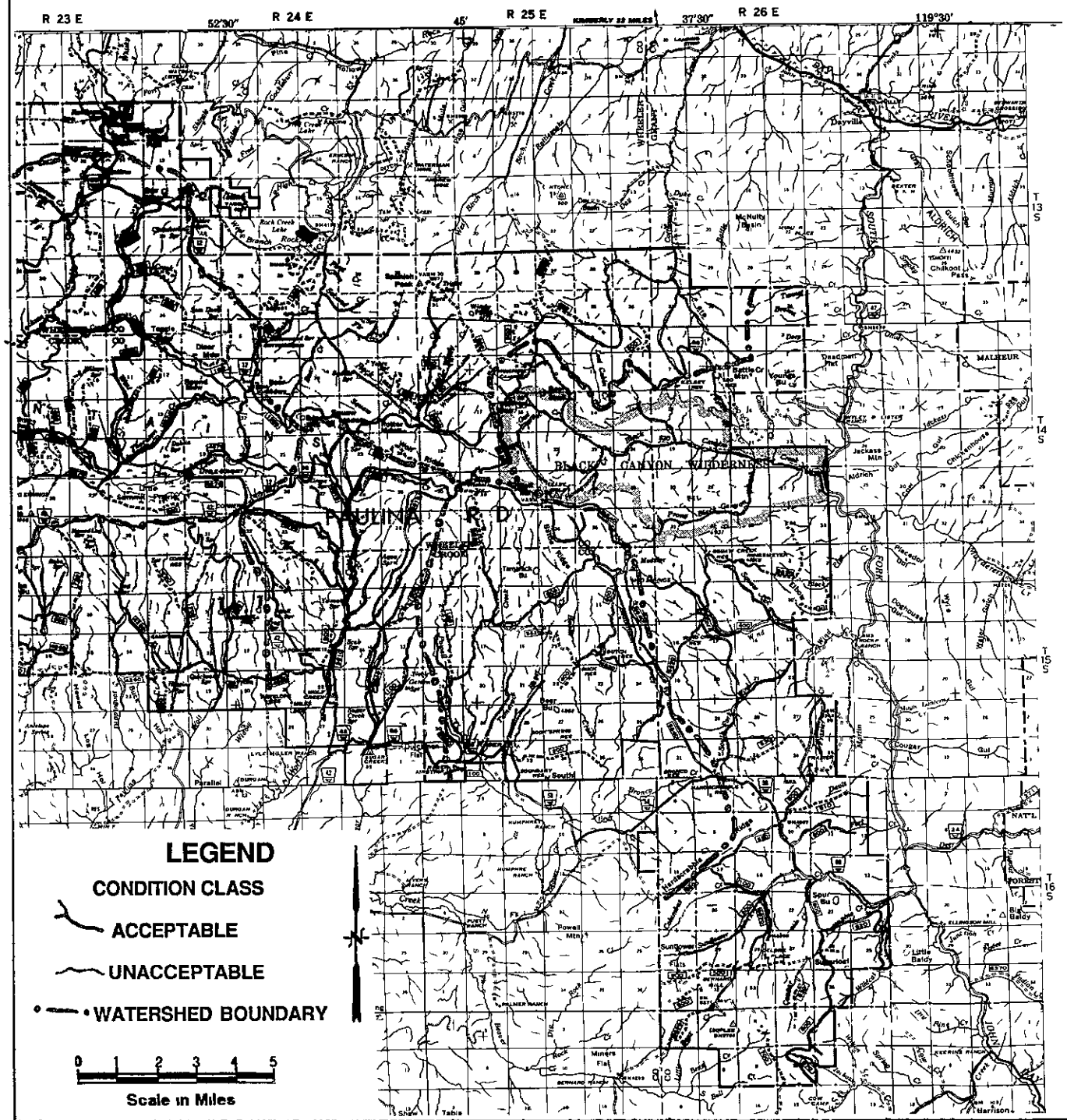


Figure 3-20

RIPARIAN ANALYSIS

SNOW MOUNTAIN

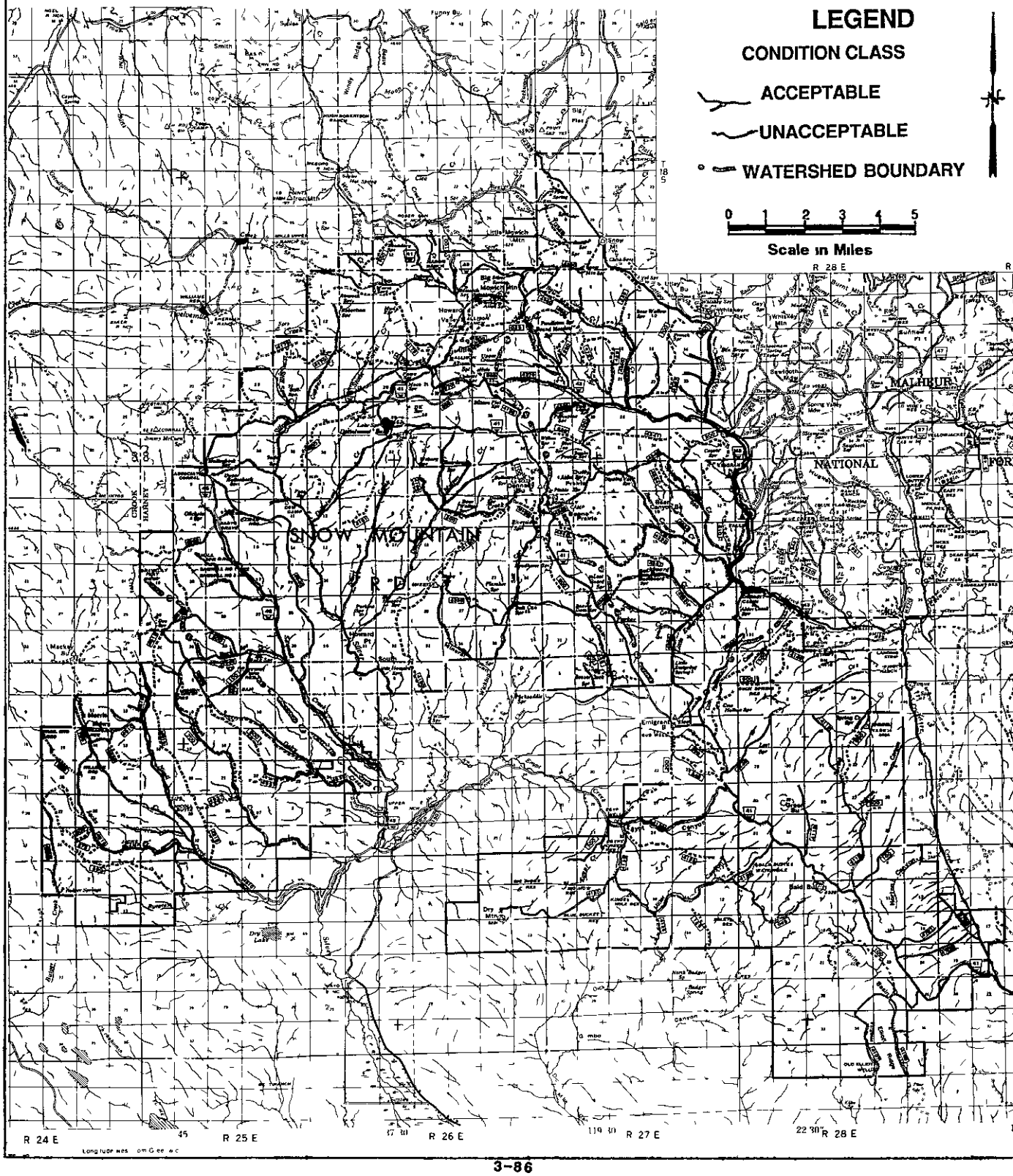
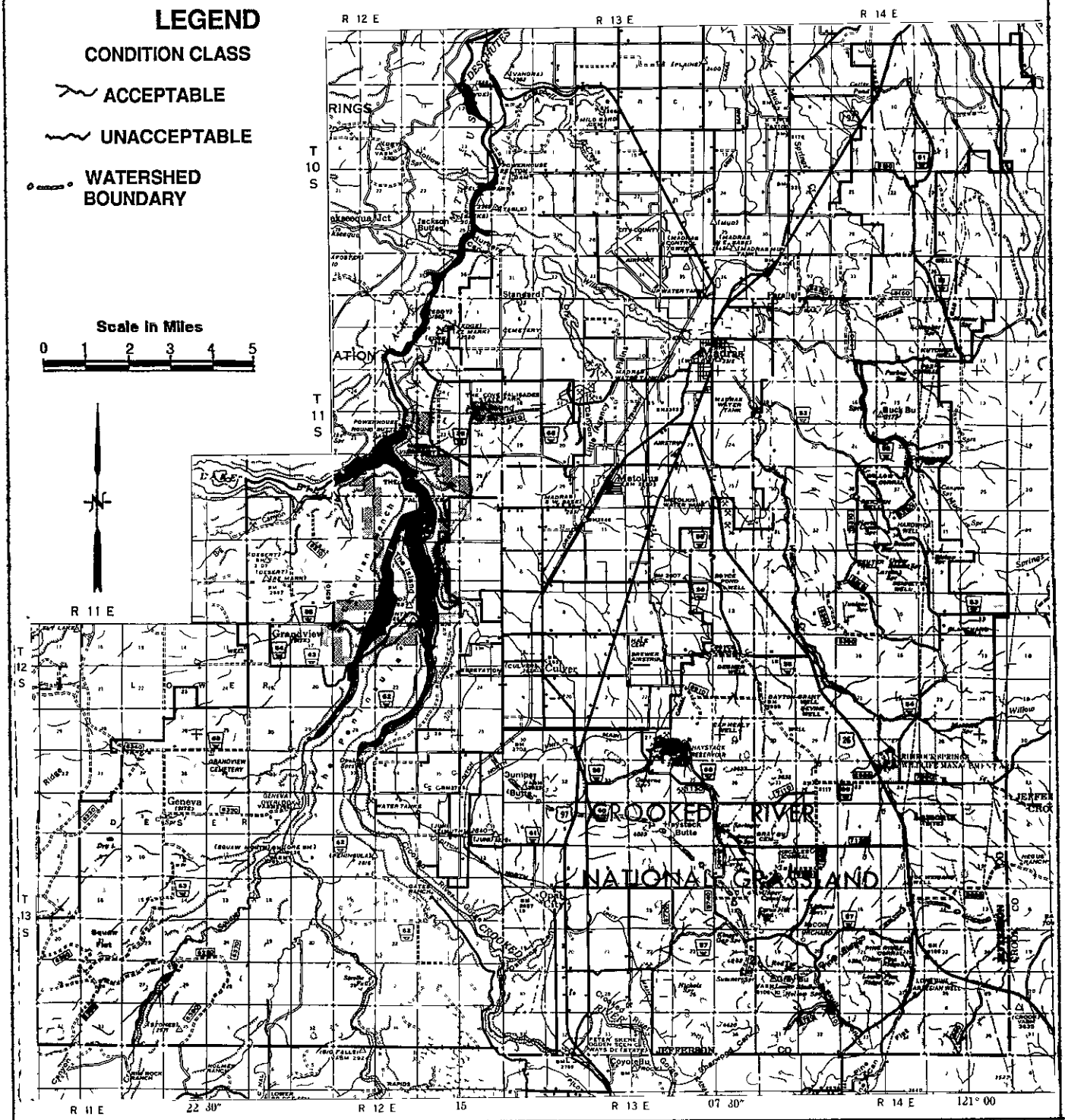


Figure 3-21

RIPARIAN ANALYSIS

CROOKED RIVER NATIONAL GRASSLAND



Wetlands

Wetland basins collect and hold water, buffering the effects of floods and conserving moisture for drier seasons of the year. Executive Order 11990 requires the conservation and protection of wetlands for their unique values. The Ochoco National Forest and Crooked River National Grassland do not have an inventory of wetlands separate from the riparian classification.

Demand

Surface flow from the Ochoco National Forest is in demand for irrigation. The quantity used is small when compared with that distributed by irrigation canals from local reservoirs. Except during drought periods, the supply of water for surface flow irrigation exceeds the demand. Throughout the life of this plan, the cost of irrigating additional lands is expected to be prohibitive.

Runoff from the Ochoco National Forest is captured by downstream reservoirs for later use. Two major reservoirs fed by the Ochoco National Forest, the Ochoco and Prineville reservoirs, have a combined capacity to store over 200,000 acre feet of water. Half of the Ochoco Reservoir's basin is administered by the Ochoco National Forest and 84% of the runoff originates on Forest land. Only 19% of the Prineville Reservoir basin is Forest land, however, this portion generates 39% of the runoff. The Haystack Reservoir on the Crooked River National Grassland is a redistribution reservoir that is supplied water through the North Unit Main Canal of the Deschutes River. The watersheds of the Crooked River National Grassland do not contribute significant amounts of water to this reservoir. The major consumptive use of reservoir water is for agricultural crop irrigation, with demand being highest from April to September. Water sports, fishing, and other recreational activities are also important and increase uses of the water in these reservoirs.

Direct uses of water by the Forest Service include water developments for livestock and wildlife, campgrounds, fire control, dust abatement and administrative sites. The largest volume of water appropriated by the Forest Service is used for livestock watering. Some water use rights are reserved to the Forest Service (e.g. fighting fires), others the Forest Service has applied for and received through the State of Oregon (e.g. water developments), and other rights are obtained through temporary permits (e.g. dust abatement). An emerging issue on the Ochoco National Forest is the need to recognize the importance of maintaining continuous flows within perennial channels, as well as a natural range of flows within all channels. These types of flows are important for channel maintenance and for the survival of fish and wildlife species dependent on this water.

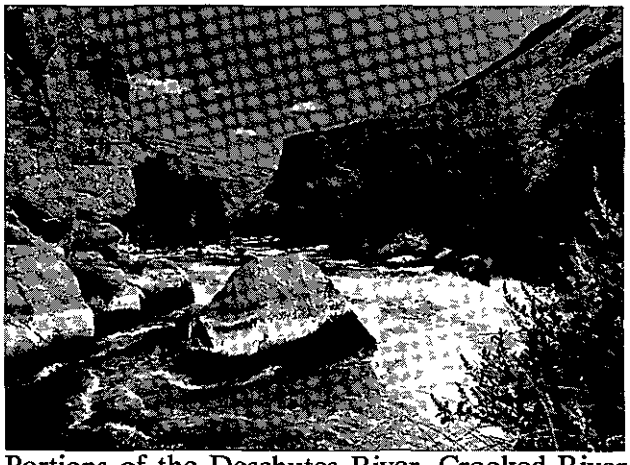
Ground water yields from wells vary greatly. Lands of the Ochoco National Forest are underlain by a variety of massive, fractured, or jointed volcanic rock and interbedded water-laid deposits. As a consequence, water yield from wells on the Forest ranges from less than 5 gallons per minute (gpm) at hand pump wells in campgrounds, to between 25 and 200 gpm from wells at administrative sites. The majority of these wells have some artesian properties.

Wild and Scenic Rivers

In 1968, through an act of Congress (Public Law 90-542), the National Wild and Scenic Rivers System was created. The policy of the United States, as established in the Act, is "... that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations."

The Wild and Scenic Rivers Act defines three classes of rivers: "wild," "scenic," and "recreational." Wild river areas are those rivers, or sections of rivers, that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These

represent vestiges of primitive America. Scenic river areas are those rivers, or sections of rivers, that are free of impoundments, with shorelines or watersheds still largely primitive and natural appearing. Limited access by roads may occur in places. Recreational river areas retain natural, free flowing characteristics, but shorelines may show evidence of some agricultural or forestry uses, past water diversions, or existing minor improvements or diversions.



Portions of the Deschutes River, Crooked River and North Fork of the Crooked River on the Ochoco National Forest and Crooked River National Grassland were designated in 1988, under the National Wild and Scenic Rivers Act through the Oregon *Omnibus Wild and Scenic Rivers Act (see* Figure 3-22). As required by the Wild and Scenic Rivers Act, management plans are being developed for each of these wild and scenic river areas and will be completed within three years of each river's official designation. These rivers are discussed below.

Deschutes River

The portion of the Deschutes River that flows through the Crooked River National Grassland has been designated as "Scenic." This area is to be managed by the Bureau of Land Management.

Crooked River

The portion of the Crooked River that flows through the Crooked River National Grassland has been designated as "Recreational." This area is to be managed by the Bureau of Land Management.

North Fork of the Crooked River

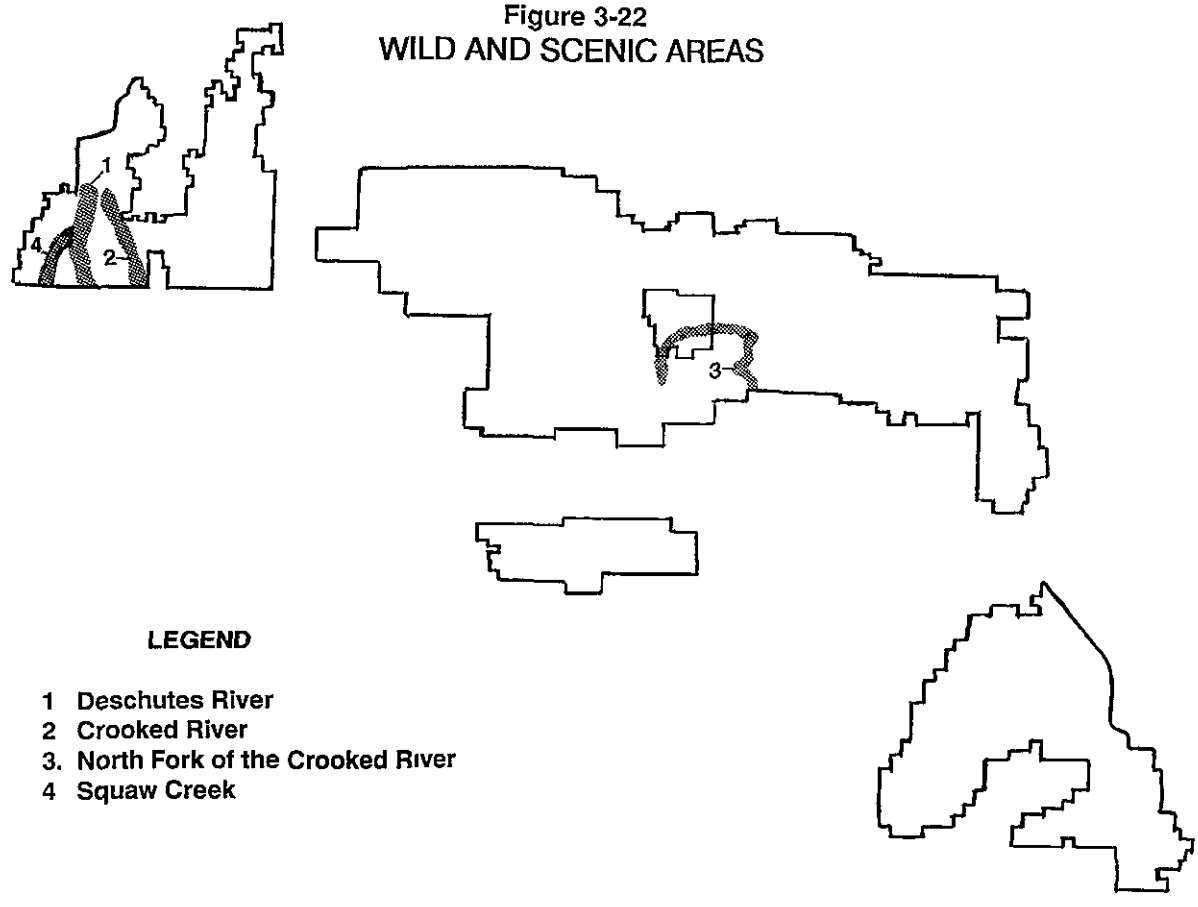
The portion of the North Fork of the Crooked River that flows through the Ochoco National Forest has been designated in three segments. The first segment, from the river source to where the river enters the Big Summit Prairie has been designated as "Recreational." The second segment, from where the river exits the Big Summit Prairie to the confluence of Deep Creek, has been designated as "Recreational." The third segment, from the confluence of Deep Creek to the Ochoco National Forest boundary, has been designated as "Scenic." The portion of this river, between segments one and two, that flows through the Big Summit Prairie (private land), has no official designation under the Oregon Wild and Scenic Rivers Bill.

Lower Squaw Creek

Lower Squaw Creek on the Grassland has been evaluated for its eligibility and suitability for designation as a "Scenic River" in the Wild and Scenic Rivers System. The suitable segment runs from the Grassland boundary to the confluence with the Deschutes River, 1,370 acres.

The possible recommendation of this segment of Lower Squaw Creek is discussed in Chapter 2 of this FEIS under Alternatives B-Modified and I. Any recommendation would be preliminary, and would receive further review and possible modification by the Chief of the Forest Service, the Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on designation of rivers as part of the National Wild and Scenic Rivers System.

Figure 3-22
WILD AND SCENIC AREAS



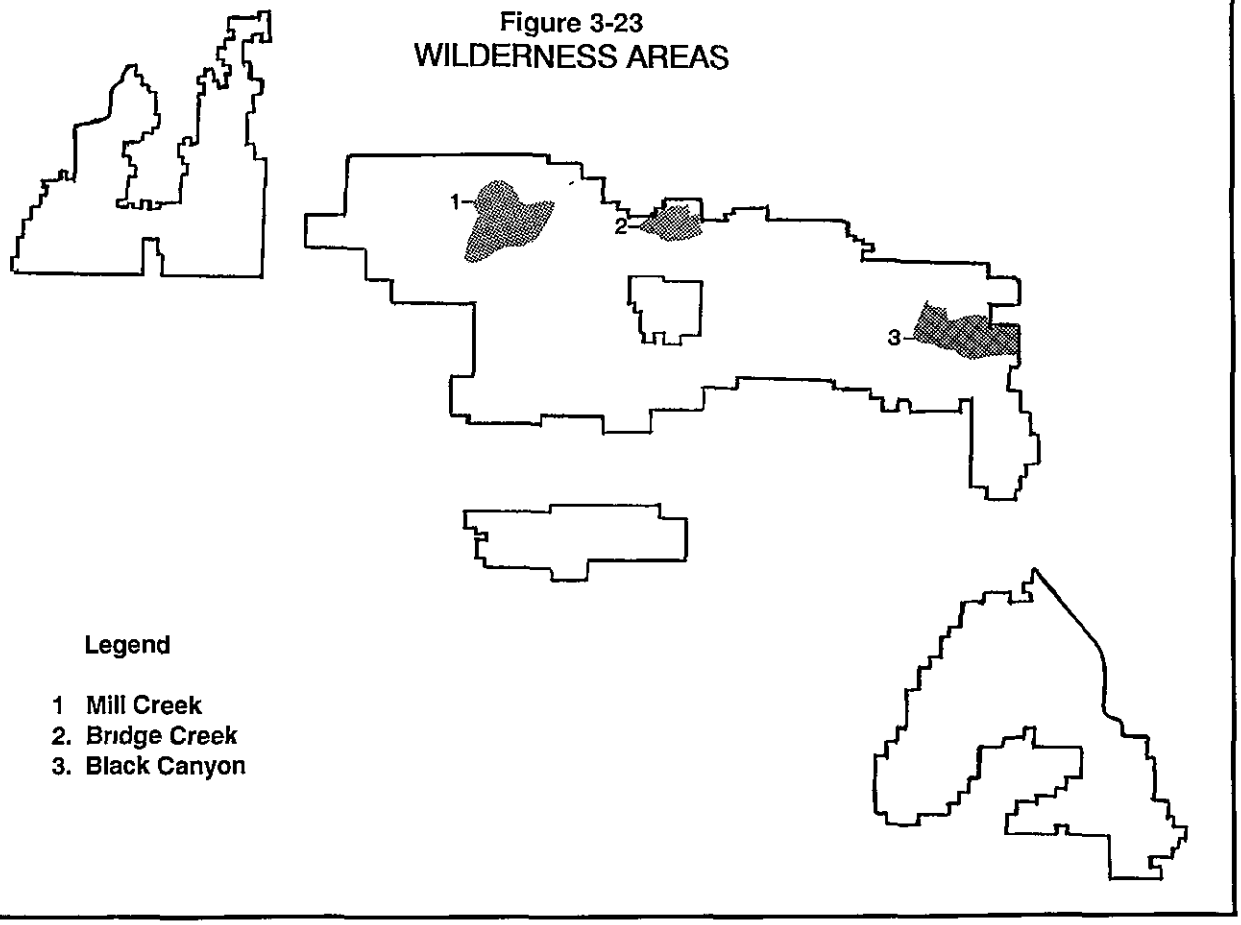
Wilderness

On June 26, 1984, President Reagan signed the Oregon Wilderness Act (Public Law 98-328). This Act resulted in wilderness designation for the following three roadless areas on the Ochoco National Forest: Black Canyon, Bridge Creek, and Mill Creek (Figure 3-23). Wilderness plans have been developed for the Bridge Creek, Mill Creek, and Black Canyon areas, and can be found in Appendix F of the Forest Plan. Each wilderness area is described briefly here.

Black Canyon Wilderness

This wilderness area (approximately 13,400 acres) is dominated by steep, xeric canyons with shallow streams in the bottoms. Almost half of the area consists of nontimbered openings on the ridge tops and south facing slopes. The timbered areas consist of mixed conifer and old-growth ponderosa pine stands. The varied and diverse vegetative conditions provide excellent habitat for nearly 300 different species of wildlife. The area provides yearlong habitat for both deer and elk. There are seven entry points into the area, tying 14.5 miles of trail together to access the canyon bottom. The rugged, steep, and broken terrain of the canyon allows for isolation and solitude, offering one of the most primitive recreational opportunities on the Forest.

Figure 3-23
WILDERNESS AREAS



Mill Creek Wilderness

This wilderness area (approximately 17,400 acres) has a variety of terrain, from steep, broken, lattice type patterns of ridges and canyons, to an almost flat plateau area. The area is mostly old-growth mixed conifer with some high elevation meadows and small openings. There are many small streams and an abundance of riparian habitat. There are several valid gemstone mining claims that utilize primitive roads for motorized access. An 18-mile trail system covers much of the area and connects several campgrounds located just outside the Wilderness boundary. The opportunities for solitude are low due to the proximity of Forest roads and heavy recreational use.

Bridge Creek Wilderness

This wilderness area (approximately 5,400 acres) contains an escarpment that essentially divides the area into two plateaus. Over half of the vegetation is dense mixed conifer, and the remaining area is predominantly a "dog hair" thicket of lodgepole pine. The area contains a working irrigation system consisting of a dam, pipeline, flume, and ditch. The absence of maintained trails in this area provides opportunities for recreational experiences with little chance of encountering other people. Current use is relatively low.

Wilderness Study Areas

In addition to the above wilderness areas, approximately 1,125 acres of land administered by the Ochoco National Forest are included in the Bureau of Land Management's North Fork Wilderness Study Area (OR-5-31). The BLM Draft Environmental Impact Statement (April 1985) for wilderness in Oregon's public domain lands, selected a "No Wilderness" alternative for this area. Wilderness characteristics on Ochoco National Forest lands will be protected until a Final Environmental Impact Statement is issued, and a decision is finalized.

The Deschutes Canyon-Steelhead Falls roadless area (Figure 3-6) on the Crooked River National Grassland was also affected by the Oregon Wilderness Bill. This area was placed in the further planning category by the second Roadless Area Review and Evaluation (RARE II). The Oregon Wilderness Bill directed that areas in this category be analyzed in the forest planning process and a recommendation of wilderness or nonwilderness be made as a result of that process. The Forest Service and Bureau of Land Management have jointly studied the area's wilderness potential as reported in Appendix C. Recommendations for wilderness designation, continued roadless area management, or further development of the area are presented in the alternatives described in Chapter 2.

Wildlife and Fish

Wildlife

The Ochoco National Forest and Crooked River National Grasslands provide habitat for a wide variety of wildlife. Over 375 different species of reptiles, amphibians, birds, and mammals are known or expected to occur on the Ochoco National Forest and Crooked River National Grassland.

Wildlife habitat provided by the Ochoco National Forest is not duplicated in the immediate area. The Ochoco National Forest is relatively isolated from its neighboring national forests, and adjacent forest lands are not extensive. Compared to the surrounding "high desert," the Ochoco National Forest offers a greater diversity of habitats.

The Ochoco National Forest and Crooked River National Grassland have become a popular focal point for hunters due to the large deer population, the occasional trophy sized elk, and the relative closeness to population centers west of the Cascades. Wildlife viewing and fishing are also popular recreational pursuits.

Mule Deer

Mule deer reached high density levels during the late 1950's and early 1960's. A decline in deer population followed with a leveling by the mid-1970's. Deer populations have remained relatively constant since. Considering loss of natural winter ranges and increased agricultural depredation, the Oregon Department of Fish and Wildlife (ODFW) set a management objective of 22,600 mule deer. Current population levels supported by the Ochoco National Forest and Crooked River National Grassland habitat approximate this objective.

Rocky Mountain Elk

Rocky Mountain elk populations on the Ochoco National Forest were lower prior to 1975. Fearing competition with deer for the winter range resource, the ODFW traditionally held an either sex elk hunting season. With new information, the ODFW initiated controlled harvest on antlerless elk during the mid-1970's. This modification of the hunt resulted in a slow but steady increase in elk numbers during the past few years. Now there are approximately 2,300 elk on the Ochoco National Forest according to a 1989 ODFW estimate.

Antelope

Antelope have slowly increased in population and have expanded their range on the Ochoco National Forest for the past two decades. No significant additional increase in their population is anticipated since the suitable habitat appears to be fully occupied. The current population on the Ochoco National Forest is estimated to be 590 animals. Antelope on the Crooked River National Grassland and adjacent private lands are estimated to be between 70 and 160 animals. This herd has grown from an introduction of twelve animals by the ODFW in 1969.

Small Game and Furbearers

Small game on the Ochoco National Forest and Crooked River National Grassland are not abundant. The most common are California valley quail, morning dove and waterfowl. Ruffed and blue grouse, snowshoe hare, and common snipe are less abundant.

The most common furbears are beaver, muskrat, mink, long- and short-tailed weasels, raccoon, bobcat, and coyote. Presently, beaver trapping for pelts is not allowed on the Ochoco National Forest and Crooked River National Grassland. Beaver are increasing by natural recruitment and by relocation of live-trapped "problem" beaver from other areas..

Demand

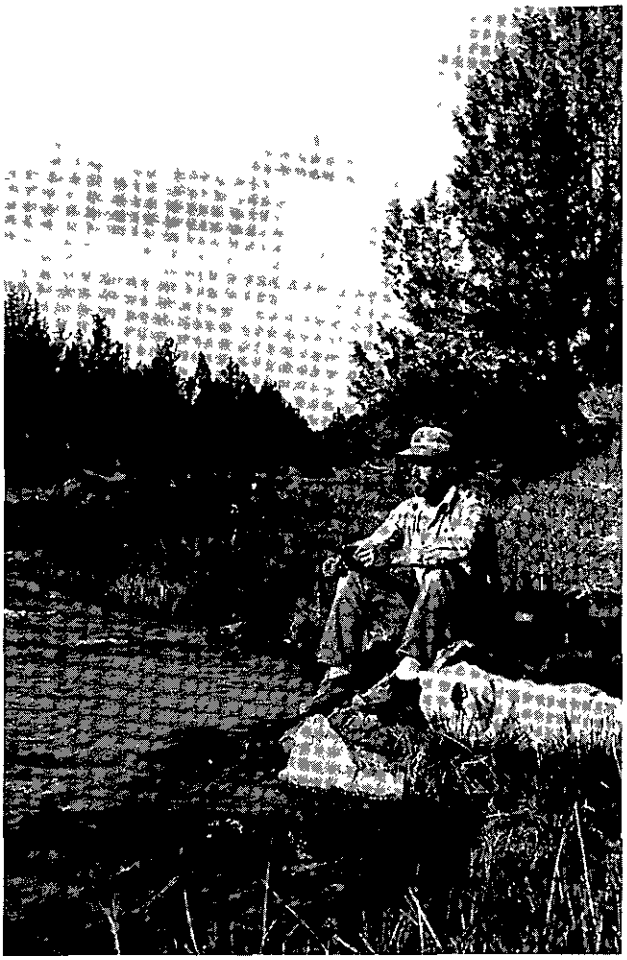
The demand for wildlife provided can be divided into two categories: consumptive and non-consumptive. Probably the best examples of consumptive demand for wildlife are hunting and fishing. The Oregon Department of Fish and Wildlife (ODFW) has established desired population levels (management objectives) for some big game species. The ODFW management objective for mule deer is 22,600. The previous level for elk, 1200, has been raised to the current management objective of 2,600. These management objectives have been used as indicators of demand during the planning process.

Though not quantified, non-consumptive wildlife demand is a recognized aspect of habitat management. Examples of this type of demand are viewing and photographing wildlife. The recent development of the Rimrock Springs Wildlife Viewing Area on the Crooked River National Grassland is an example of providing for this demand. Trails and viewing sites are provided to enhance wildlife viewing opportunities.

Fish

The Ochoco National Forest and Crooked River National Grassland have about 800 miles of streams. Two major rivers, the Crooked River and Deschutes River, flow through the area adjacent to portions of the Crooked River National Grassland. Only the North Fork of the Crooked River is bounded by significant amounts of Ochoco National Forest.

The Ochoco National Forest and Crooked River National Grassland have about 500 miles of streams that support rainbow trout. Brook trout are present in 20 miles of stream. Redband trout are found in streams on the Snow Mountain Ranger District.



Rough fish species (bridgelip and coarse scale) present in streams which compete with trout include suckers, dace, and sculpins. The Ochoco National Forest has three lakes (reservoirs) that provide trout fishing: Walton Lake, Delintment Lake, and Antelope Reservoir. The Crooked River National Grassland encompasses part of the Haystack Reservoir and Lake Billy Chinook shorelines. These reservoirs support trout and other warm water fish, including brown trout, kokanee, mountain whitefish, small and largemouth bass, chiselmouth, and black crappie.

The Ochoco National Forest and Crooked River National Grassland have another 195 miles of streams identified as having the potential to support rainbow trout when stream condition is improved.

Anadromous Fish

Anadromous fish habitat is now present in approximately 42 miles of stream in the northern sections of the Ochoco National Forest. These streams are used by steelhead. The estimated number of adults using these streams for spawning is 304. An additional 45 miles of perennial streams flow into stream reaches where spawning occurs. These additional stream miles are important in maintaining water quality where spawning and rearing occur.

Demand

Trout and the warm water game species are of economical value for recreational fishing. Steelhead, economically valued for commercial and sport fishing, are used by Indians for economic and ceremonial purposes. The Grassland and the portion of the Forest which occurs north of the Paulina Highway (State Hwy. 380) are included in the ceded area established in the Treaty of 1955 between the U.S. Government and the Indian tribes of Middle Oregon. This includes the Confederated Tribes of Warm Springs.

Table 3-35 lists the drainages and associated tributaries on the Forest that support anadromous fish.

Viable Populations

The Ochoco National Forest and the Crooked River National Grassland must maintain viable populations of all native and desired non-native plant and animal species. This was accomplished by defining management requirements for those species or habitats that were considered limiting or sensitive to management activities. These species and habitats are represented by management indicator species. For a further discussion of management indicator species see the Biological Diversity section in this chapter. Species listed as Threatened, Endangered, or Sensitive require additional measures to ensure their survival and recovery.

Threatened, Endangered, and Sensitive Species

The Endangered Species Act of 1973 requires that all Federal agencies protect threatened and endangered species and their habitats to aid population recovery. The U.S. Fish and Wildlife Service has responsibilities for maintaining Federal threatened and endangered lists for animals. Two species on these lists, the peregrine falcon and the bald eagle, have been observed on the Ochoco National Forest and Crooked River National Grassland. Other species have been listed by the U.S. Fish and Wildlife Service in a category indicating that insufficient data exists for a formal determination to be made.

TABLE 3-35
Ochoco National Forest
NATIONAL FOREST ANADROMOUS STREAMS AND USE

Drainage	Stream	Miles with Perennial Flow	Miles with Steelhead Spawning **	Number Adults ***
Trout Creek	Auger	3 0	1 50	6
	Dick	1 0	0 25	4
	Trout	6 0	1 50	10
	Potlid	3 0	0.50	2
	Cartright	2 0	0 60	4
	Dutchman	2 0	0 60	6
	Big Log	2 0	1 00	4
Bear Creek	Bear Creek plus Tributaries	7 0	3 50	21
	Dodds	2 5	1 25	11
Bridge Creek	West Branch	1 0	0 50	2
	Bridge (Main)	4 0	4 00	25
	Maxwell	1 5	*	*
Badger Creek	Badger	3 0	3 00	10
	Hoffman	1 5	*	*
	Milk	1 5	0 50	10
	Bug	1 0	*	*
	Indian	2 0	*	*
Rock Creek	Rock Creek plus Tributaries	7 5	7 50	47
	Baldy Creek plus Tributaries	4 0	1 00	6
	Bear	2 0	*	*
	Fir Tree	1 5	*	*
Cottonwood	Cottonwood	9 0	4 75	16
Black Canyon	Black Canyon	11 0	6 50	92
	South Prong Black Canyon	4 0	1 00	8
Wind Creek	South Fork Wind Creek	2 0	1 00	6
	North Fork Wind Creek	2 0	1 25	8
TOTALS		87 0	41 70	304

* Data not available

** From actual and estimated use based on stream inventories from 1959-1985 Oregon Department of Fish and Wildlife, John Day, Oregon

*** Estimated adult escapement to spawn

Management of habitat for threatened and endangered animal species is designed to promote recovery of the species leading to their removal from threatened or endangered lists. Habitat management for sensitive species is planned to avoid any effects that might cause the species to become threatened or endangered.

Threatened Species

Bald Eagles winter on the Ochoco National Forest. Winter roost sites, an important part of their habitat component, are known to exist on the Big Summit, Prineville, Paulina, and Snow Mountain Ranger Districts. Roost sites are also suspected on the Crooked River National Grassland as well, no nesting sites have been found. A Bald Eagle winter roost study, contracted by Oregon State University was completed in 1987. The purpose of the study was to locate roost sites and develop guidelines for protection. A Bald Eagle Recovery Plan is schedule for completion in 1989, which will provide specific direction for management of roosting sites.

Endangered Species

Peregrine Falcons are occasionally observed on the Ochoco National Forest or Crooked River National Grassland. Infrequent sightings indicate migrating individuals. There are no known nesting sites on the Ochoco National Forest or the Crooked River National Grassland.

Sensitive Species

The Regional Forester has responsibility for designation of sensitive species. Sensitive species are not on federal lists. Regional Forest Service policy is that species listed by the State of Oregon as threatened, endangered, or sensitive, and not on Federal lists, will be considered sensitive by the Forest Service. The most current list of Region 6 Sensitive Species for the Ochoco National Forest and Crooked River National Grassland is shown in Table 3-36.

Table 3-36

Threatened, Endangered, and Sensitive Species

		Federal	State	R-6	N.F.
Sensitive Birds					
Ferruginous Hawk	*Buteo regalis*	Cat. 2		OR	S
Swainson's Hawk	*Buteo swainsoni*	Cat. 2	S	OR	D
N. Bald Eagle	*Haliaeetus leucocephalus*	T	T	*/OR	D
Western Sage Grouse	*Centrocerus urophasianus*	Cat. 2		*/OR	D
Greater Sandhill Crane	*Grus canadensis tabida*		S	*/OR	D
Western Snowy Plover	*Charadrius alexandrinus nivosus*	Cat 2	T	*/OR	S
Long-billed Curlew	*Numenius americanus*	Cat. 2		*/OR	D
Western Yellow-billed Cuckoo	*Coccyzus americanus occidentalis*				
Sensitive Mammals					
Preble's Shrew	*Sorex preblei*	Cat. 2		OR	S
California Wolverine	*Gulo gulo luteus*	Cat. 2	T	*/OR	D
Sensitive Fish					
Redband Trout	*Salmo* spp	Taxonomic uncertainty			D
Malheur Mottled Sculpin	*Cottus bairdi* spp.	Cat. 2		OR	D
Sensitive Plants					
Brandegee Onion	*Allium brandegei*		T	OR	S
Sierra Onion	*Allium companulatum*		T	OR	D
Swamp Onion	*Allium madidum*	3c	S	*	D
Prairie Sage	*Artemisia ludoviciana* spp *estesii*	Cat. 2	T	OR	S
John Day Milk-Vetch	*Astragalus diaphanus* var. *diaphanus*	Cat 2	E	OR	S
John Day Milk-Vetch	*Astragalus diaphanus* var *diurnus*	Cat. 2	E	OR	S
Deschutes Milk-Vetch	*Astragalus tegetarioides*	Cat. 2	T	OR	S
Long Bearded Sego Lily	*Calochortus longebarbatus* var. *peckii*				D
Long Bearded Sego Lily	var. *longebarbatus*	Cat 2	T	*/OR	S
Bristle-flowered Collomia	*Collomia macrocalyx*	Cat 2	S	OR	D
not listed	*Lupinus cusickii*	Cat. 2	T	OR	S
Henderson Ricegrass	*Oryzopsis hendersonii*		T	*/OR	D
Scapose Silene	*Silene scaposa* var *scaposa*	Cat. 2	T	OR	S

Definitions

Federal: 1985 Federal Register Notice of Review
- T = Threatened
- Category 2 = Needs additional information before proposing a federal listing
- Category 3c = Deleted species, taxon more abundant and widespread than previously thought

State Oregon State Status Regional Forester's
- E = Endangered
- T = Threatened
- S = Sensitive

R-6 Sensitive Species List
- OR = Sensitive in Oregon
- * = Potential candidate for Regional Forester's list

N F Ochoco National Forest
- D = Determined to be present
- S = Suspected to be present

Chapter 4

Environmental Consequences

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

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Environmental Consequences

Introduction

The purpose of this chapter is to disclose the environmental consequences (effects) of the six alternatives described in Chapter 2, based on currently available scientific and/or analytical information. Effects are discussed for "components of the human environment," which includes the natural and physical environment and the relationship of people with that environment. Discussions are not necessarily limited to effects that occur on the Ochoco National Forest and Crooked River National Grassland, but also include a reasonable assessment of effects on both people and natural resources within the entire affected area, as discussed in Chapter 3.

Changes Between the DEIS and FEIS

Many changes were made between the Draft and Final Environmental Impact Statements which resulted in changed analysis and environmental consequences discussed in this chapter. Based on public comment to the DEIS four additional issues, concerns and opportunities (ICO's) were added to the original list of twelve (see Issues, Concerns and Opportunities - Chapter 1). The four added ICO's include: Anadromous Fish, Historic Trail Preservation - Summit Trail, Off Road Vehicle (ORV)Use, and Round Mountain. Issues of regional and national importance have also evolved, or increased in intensity since the DEIS. These include: biological diversity, forest residues (related to long term productivity), forest health (formerly discussed as "forest pests"), and old growth (formerly discussed under "vegetation").

Eleven alternatives for management of the Forest and Grassland were presented and analyzed in the DEIS. Some alternatives were subsequently modified or dropped from further detailed study. Two alternatives were added to respond to the ICO's and public comments. One of these alternatives (Alternative No Change [NC]) was added in response to the Supplement to the DEIS, which was simply a continuation of the existing Ochoco National Forest Timber Resource Plan. The other (Alternative I - Preferred) is a completely new alternative. See Chapter 2 for detailed discussion of final alternatives.

Regional and Washington Office (U.S.D.A. Forest Service) reviewers of the DEIS commented that many of the discussions on environmental consequences revolved around Forest and Grassland programs of work, rather than on the actual environment. In addition, some public comments suggested that environmental consequences were inadequately addressed in the DEIS. Changes in discussions in this chapter of the FEIS reflect those comments, as well as higher order changes in regulations, policy and procedures germane to the National Environmental Policy Act of 1969.

Major Assumptions

Management requirements, as discussed in detail in Chapter 2, are a legal requirement of NFMA (National Forest Management Act) and are designed to limit the potential environmental effects of any of

the alternatives. Standards and guidelines, as discussed in Appendix D, serve as specifications for implementing the management requirements and as an enforcement mechanism for meeting the desired future conditions associated with the respective alternatives. All effects disclosed in this chapter (4) assume that standards and guidelines are being met for all of the alternatives. Environmental effects of management would be unacceptable in the absence of these standards and guidelines, because they would result in a reduction of long term productivity of Forest and Grassland resources.

Some routine operations that the Forest engages in are considered environmentally insignificant. These are discussed in this chapter (Activities with No Significant Environmental Effects).

This chapter contains complex discussions about the environment, and the reader's understanding of it will be improved with a thorough review of both Chapter 2 and Chapter 3. Environmental components are the subject of the analysis in this chapter and have been introduced in the same order in Chapter 3. Outputs such as timber harvest levels vary by alternative and are presented in Chapter 2. The objective of this chapter is to further elaborate on the environmental effects that would occur as the result of producing the outputs, programs and resources discussed in the previous chapters, by alternative. Because of the issues, concerns and opportunities, some of the "programs and resources" are also discussed as environmental components (e.g. timber supply). Environmental components are introduced alphabetically and discussed in various detail, based on the significance of the issues, concerns or opportunities surrounding them. These components include:

Air Quality
Biological Diversity
Cultural Resources
Facilities
Fire
Forage
Forest Health
Forest Residues
Fuelwood
Lands
Minerals and Energy
Old Growth
Recreation
Scenic Resources
Social and Economic
Soil
Timber
Transportation System
Unroaded Areas
Water (including Riparian Areas, Wetlands and Floodplains)
Wild and Scenic Rivers
Wilderness
Wildlife and Fish

For each environmental component, the following discussions are provided: (a) direct effects, (b) indirect effects, (c) cumulative effects, (d) mitigation measures, and (e) conflicts with other plans and policies.

Direct Effects are those caused by an action, that occur at the same time and place of the action. As an example, a newly constructed road will affect the soil resource by removing land from production and dedicating it to the transportation system.

Indirect Effects are those caused by an action but are later in time or farther removed in distance from the action; however, they are still reasonably foreseeable. An example would be the increase in growth rate of trees on a particular parcel of land as a result of a properly applied silvicultural treatment, or an increase in water turbidity (and therefore a decrease in water quality) as a result of excessive soil erosion.

Cumulative Effects are those that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. Use of heavy machinery for logging or slash piling may have unnoticeable effects on soil after just one

entry, but repeated use over a period of years may compact that soil to the point where it is no longer able to grow vegetation. This would be a clear example of a "cumulative effect" of a management action on the soil resource.

Mitigation Measures are actions taken to reduce the risk associated with an environmental effect. The objective may be just to reduce the severity of the effect, or to eliminate the effect all together. From the CEQ Regulations (40 CFR 1508.20), mitigation includes:

1. Avoiding the effect altogether by not taking a certain action or parts of an action.

2. Minimizing effects by limiting the degree or magnitude of the action and its implementation

3. Rectifying the effect by repairing, rehabilitating, or restoring the affected environment.

4. Reducing or eliminating the effect over time by preservation and maintenance operations during the life of the action.

5. Compensating for the effect by replacing or providing substitute resources or environments.

Conflicts with other plans and policies for a specific resource might include, as an example, a discrepancy in planned outputs of big game from the Forest, versus those planned or scheduled by the Oregon Department of Fish and Wildlife.

Following the disclosure of effects by environmental component are five special sections which discuss: (a) the relationship between short term uses of man's environment and the maintenance and enhancement of long term productivity, (b) irreversible and irretrievable commitments of resources associated with the preferred alternative (I), (c) unavoidable environmental effects associated with the preferred alternative (I), (d) other specifically required disclosures, and (e) conflicts with other federal, regional, state and local plans (including Indian Reservation Plans) as an overview.

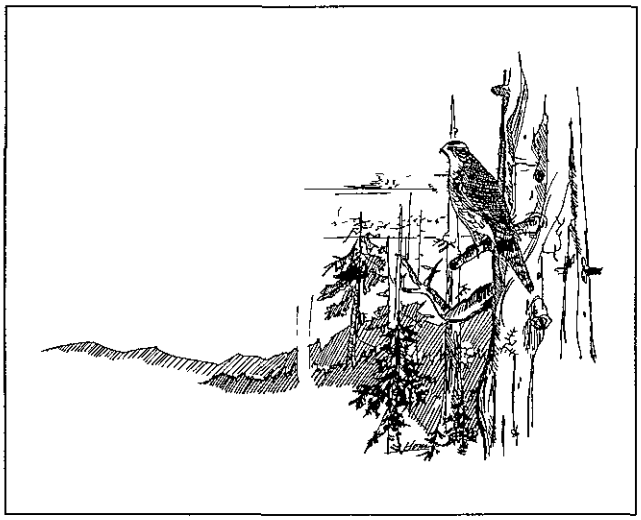
Activities with No Significant Environmental Effects

The Forest engages in some management activities that do not involve significant environmental effects. These activities are categorized as routine operations, and individually or cumulatively have been found to have no significant effects based on public issues or experience with the procedures normally employed by the Forest Service. Routine operations include such things as renovation and upkeep of facilities, trail maintenance, actions controlled by permit systems including firewood gathering, collection of plant materials, outfitter and guide services, placement and maintenance of climatological instruments, custodial maintenance, administrative actions, and others.

Other actions of limited size or magnitude have also routinely been found to produce little or only limited short-term effects on the environment. This determination for future actions involves careful consideration by Forest officials, but may be addressed as categorical exclusions (40 CFR 1508.4) in environmental assessment and project planning. Some low impact silvicultural treatments, pest management activities, range and wildlife improvement projects, watershed improvement projects, mineral and energy activities, land transfers and other vegetation management activities may fall in this category (7 CFR 1b.3). Some actions categorically excluded require a maintained project file, as well as preparation of a Decision Memo; these are subject to review under 36 CFR 217.6.

Environmental Consequences of the Alternatives

Air Quality



Two by-products of management activities prescribed in the alternatives have the potential of significantly affecting air quality. They are smoke and dust. The quantities of these pollutants have indirect effects on visibility and in limited circumstances on human health.

Direct Effects

Dust

A potential for short-term air quality impairment from dust is created by a variety of management practices. Machinery operations related to timber management often raise clouds of dust. Traffic on roads is another source of dust. Prescribed burn areas can also be a source of dust on windy days, depending on time of burn, subsequent rainfall and revegetation. Road construction and maintenance machinery operations are also dust contributors both in the actual road work and in rock crushing operations. These impacts are usually of a local nature and short duration.

Anticipated levels of fugitive dust from these management activities are considered too low for detailed projections. They will also tend not to vary greatly among alternatives. They will be discussed further in the mitigation section

Smoke

The principal smoke emissions affecting visibility are the fine particulates added to an airshed. Particulates contributed to the air by activities are measured by tons of total suspended particulates (TSP).

Smoke contributes most of the particulate material that originates from the Forest and Grassland. The two major sources of smoke for the area are from wildfires and prescribed burning.

The TSP production from wildfires is highly variable, estimates for the Ochoco National Forest and Crooked River National Grassland range from 25 tons/year in years of infrequent wildfires to 4,000 tons in years of numerous wildfires.

The TSP production from prescribed burning will vary among the alternatives, depending on the mix of management activities such as range improvements, timber management practices, wildlife habitat improvement, road construction, and natural residue hazard reduction. The following assumptions are made in the discussion of smoke-generated TSP's:

> The estimated TSP's contributed by smoke from wildfires will not vary among alternatives and therefore are not included in projections.
>
> TSP production rate used was 25 pounds per ton of activity residue consumed and 40 pounds per ton of natural fuels consumed (personal communications with Dave Sandberg, PNW Forest Residues Lab, Seattle, WA, 1989).

Table 4-1 depicts a decline in emissions projected for all alternatives over time. This is due to the expected gradual reduction in natural residue loadings from current levels and an increase in utilization of activity residues. All alternatives level off and reach an equilibrium of 4 to 6 thousand tons of TSP per year near decade four.

Table 4-2 displays the percent change in the production of TSP's from the 1983-85 Baseline established by Region 6 (U.S.D.A. Forest Service, 1988). The Forest will meet the State's goal of a demonstrable reduction in emissions from Eastern Oregon sources (State of Oregon, 1987). See Cumulative Effects for further discussion of this Forest's TSP contributions in relation to the State of Oregon and Region 6 of the Forest Service.

There is also an indirect effect on winter air quality in local urban communities through the fuelwood provided by the Forest and Grassland. This form of utilization of former waste residue helps reduce smoke emissions from the Forest but now tends to concentrate those emissions in the towns. A discussion of this indirect effect is included in the Fuelwood section of this Chapter.

TABLE 4-1
Total Suspended Particulate Emissions
(Tons / Year)

	ALTERNATIVES					
DECADE	NO CHANGE	B-MOD	E-DEP	I Preferred	A	C-MOD
Last	9,200	9,200	9,200	9,200	9,200	9,200
First	7,300	7,900	7,600	7,400	7,300	7,700
Second	6,900	6,400	6,700	7,000	6,900	6,900
Third	6,700	6,400	5,400	6,400	6,700	7,100
Fourth	5,500	5,300	4,500	4,200	5,500	5,700
Fifth	4,900	5,600	4,300	5,400	4,900	6,000

TABLE 4-2
Total Suspended Particulate Emissions
Percent Change from 1983-85 Baseline of 9000 Tons/Year

	ALTERNATIVES					
DECADE	NO CHANGE	B MOD	E-DEP	I Preferred	A	C MOD
Last	+2	+2	+2	+2	+2	+2
First	-19	12	26	-28	-19	24
Second	-23	-29	-26	-22	-23	23
Third	-26	29	-40	-29	-26	21
Fourth	-39	41	-50	-53	39	37
Fifth	-46	-38	-52	-40	46	-33

Indirect Effects

Visibility

Smoke and dust reduce visibility. There is a direct relationship between TSP amounts and visibility impairment. For example, the amount of visibility impairment (measured in days of smoky conditions) will be twice as much if TSP production doubles. The percent change from present TSP levels can be interpreted as resulting in a similar percent change in visibility quality. The effects of each alternative on visibility can be seen in Table 4-2. The reductions in TSP levels represent a similar reduction in visibility impairment compared to the 1983-85 Baseline period.

Human Health

The FEIS on Managing Competing and Unwanted Vegetation (U.S.D.A. Forest Service, 1988) provides a detailed investigation into the effects of smoke on human health. The following is a summary of that investigation pertinent to this FEIS:

> Short-term effects due to high level exposures immediately adjacent to prescribed fires or wildfires include "...eye irritation, coughing, and shortness of breath in moderate-to-heavy smoke...." This type of exposure is generally experienced only by forest workers since the general public is not normally involved in such activities.

Documentation of adverse effects from long-term exposure to wildland fire smoke is virtually nonexistent. Forest workers are at some risk of low-level exposure contributing to such health effects as emphysema or lung cancer. Long-term effects from even lower levels of smoke experienced by the public-at-large are less well known. Individuals with chronic lung disease or other respiratory ailments may experience additional irritation from the infrequent episodes of stagnated smoky airmasses.

There are a number of potentially toxic components known to exist in wildland smoke. However, the levels experienced under normal conditions and exposures are well below any levels known to cause harmful effects on humans. Some of the more common are carbon monoxide, carbon dioxide, carbon particles, and trace amounts of a number of chemicals that may enter the lungs on the surface of particulate matter. Close to 90 percent of the particulate matter is small enough (less than 2.5 microns diameter) to penetrate deeply into the lungs.

Some of the components (polycyclic aromatic hydrocarbons) are known carcinogens under exposures much higher than that documented from wildland smoke. Other components, such as the aldehydes, are acute irritants. These are most likely to affect forest workers who receive high exposures at burn sites.

Cumulative Effects

Visibilty

Because of the regional scope of visibility effects and problems, Region 6 of the Forest Service has been conducting cumulative effects analysis on TSP production through subregional analysis of emissions (for example, Eastern Oregon). The FEIS for Managing Competing and Unwanted Vegetation (U.S.D.A. Forest Service, 1988) contains the latest information on this continuing analysis. In that analysis, the Ochoco National Forest contributed approximately 15 percent of the emissions from Forest Service sources in Eastern Oregon. The Eastern Oregon subregion is projected to reduce emissions by 23 percent under the selected alternative in the Vegetation Management Plan. The Ochoco National Forest and Crooked River National Grasslands will contribute to that reduction in all of the Alternatives in this FEIS.

Human Health

The projected reductions in emissions for all alternatives should continue to widen the gap between probable exposures and any possible health effects, chronic or acute.

Mitigation Measures

These general mitigation measures are applied to the extent commensurate with the resource goals and objectives of each project.

Dust

Fugitive dust abatement will be aided through:

Road watering, oiling or paving as warranted by conditions.

Controls on machinery operations timing in relation to other use activities.

Dust abatement controls on stationary sources such as rock crushing operations.

Smoke

Smoke abatement techniques provided in the Vegetation Management FEIS will be guidelines for the Forest and Grassland.

Protection of visibility in Class I areas and the overall air quality is an important objective. All prescribed burning will be done in accordance with all state and local air quality regulations. Special care will be taken to prevent smoke from affecting the visibility in Class I areas during periods of high visitor use (closest to the west are the Central Cascade Wildernesses, but more likely to be affected is the Strawberry Wilderness to the east).

Prescribed burning will be planned to avoid smoke intrusion into smoke-sensitive areas identified in the Oregon Smoke Management Plan (Bend is the closest).

The "best available technology" will be used to reduce smoke, taking into account other land management practices and costs, as determined on a case-by-case basis. The "best available technologies" applicable to prescribed burning on the Forest and Grassland include, but are not limited to:

Utilization of woody material prior to disposal of excess.

Reducing felling breakage through directional felling.

Rigorous mop-up of prescribed burns where long duration smoldering of duff may be a problem.

Rapid (mass) ignition to reduce smoldering phase of combustion.

Burning only during optimum conditions, including burning at the highest fuel moistures practical in order to reduce fuel consumption, time ignitions in coordination with surrounding land managers to avoid overloading local air masses., and avoid burning during stable atmospheric conditions which decrease the probability of adequate smoke dispersion.

Vegetation treated with herbicide will not be burned for at least one year.

Conflicts with Other Plans

Smoke management plans in existence (Oregon State and Madras Seed Growers) provide a cooperative framework to minimize conflicts between prescribed fire users in scheduling burns. These will also minimize conflicts with other users of the Forest and Grassland and surrounding country.

Biological Diversity

Direct Effects

Management of vegetation for the production of goods and services is a primary activity on the Forest and Grassland. As a result, the abundance and distribution of plants and animals is constantly changing. Maintenance of biological diversity is essential to the long-term goals of the Forest; outputs of both commodity and noncommodity resources are dependent upon sustaining diversity. Compared to the "natural forest" of presettlement times, all alternatives have significant effects on biological diversity. Refer to Chapter 3 for discussions on how diversity has changed from historic times to its current condition.

Effects Common to All Alternatives

Regardless of the alternative considered, the ecosystem will continue to change. Soils, as a living component of the ecosystem, have changed and will continue to change due to the elimination of fire. Most plant communities have been accumulating high fuel loadings for over a century, and the danger of catastrophic wildfires that destroy forest floor organic materials is increasing. On the other hand, these increases in organic materials have probably increased the productive potential of soils on some sites (Harvey, et al, 1988). In the absence of fire or comparable processes, most plant communities will change towards "climax conditions," represented by vegetative species that are able to survive and reproduce continually. Most mixed conifer timbered communities will eventually be dominated by white fir, replacing those species such as ponderosa pine, western larch, lodgepole pine and Douglas fir. Western juniper will continue to invade grassland/shrub communities, and is already considered by many the "natural species" on these sites.

None of the alternatives are designed to return the Forest and Grassland ecosystems to that which existed historically. Even though management objectives for wilderness and research natural areas include limited re-introduction of natural and prescribed fire (See Appendix D, Standards and Guidelines), and management prescriptions for timber harvesting and forage production are to a great degree based on "reversing the successional trend"

in both forested and non-forested communities, National Forest goals for the production of goods and services preclude a return to the "natural forest." Hence, it is significant that biological diversity as represented by the "natural forest" of the past is an irretrievably lost resource, particularly in respect to vast acreages of open pine/grassland vegetation that are believed to have occurred over most of the Forest.

However, all of the alternatives except Alternative No Change are designed to meet legal requirements (36 CFR 219.27) for the preservation and enhancement of diversity of plant and animal communities to the extent practical. Management requirements (Appendix F), land allocations, and standards and guidelines (Appendix D) represent tools for achieving legally mandated, and socially desirable levels of protection for all species of plants and animals, while providing needed outputs of goods and services to the nation. See Table 2-8, Chapter 2, to reference the following discussions concerning the effects on biological diversity.

Alternative No Change

Alternative No Change has the highest potential for reducing overall biological diversity on the Forest and Grassland. As management requirements for prevention of serious environmental impacts are not applicable to this alternative, it can be inferred that significant effects would occur with its implementation, including probable loss of minimum habitat for major wildlife indicator species, such as the pileated woodpecker, and degradation of water and riparian related resources.

Data is not available to determine the future condition of the forest under this alternative in terms of distribution of successional stages over time (see Table 2-8, Chapter 2). Based on the high levels of timber production with this alternative, though, it is reasonable to assume that accelerated liquidation of mature and overmature stands would result in a relatively young forest over most of the acreage available for management, and that later successional mature and old growth stands would be concentrated in wilderness and unroaded areas

Alternative B-Modified

Alternative B-Modified, with an emphasis on commodities production but modified to provide amenities important to the local community, will tend to reduce biological diversity over the long term. Timber production levels approaching maximum possible potential will tend to hasten the liquidation of old growth at a rate that will shift the structure of the forest to early successional stages. High use of uneven-aged management in this alternative will help to reduce the visible effects, but late successional stages of mature trees and old growth will be highly concentrated in wilderness and limited unroaded areas. Old growth, planned at minimum levels for dependent wildlife species, will tend to be fragmented across the managed forest, with interconnective habitat limited to that offered by riparian, and to some extent, visual management allocations. Research Natural Area allocations are limited to two areas: Ochoco Divide and The Island, which do not provide representation of a cross-section of plant community types across the Forest and Grassland, therefore limiting gene pool reserves for plant and animal species. Snag habitat for cavity nesters remains at relatively high levels in the short run but declines to 33 percent of potential by the fifth decade, lower than all other alternatives except NC. As this and all alternatives provide for legally sufficient protection of threatened and endangered plants and animals, no future extinctions are projected, but the risk of extinction is higher than with the other alternatives except No Change, as options for providing future habitat needs (currently unpredictable) are limited. Since this alternative does provide for maximum acreages of excellent riparian, as with Alternative C-Modified and I, fish and wildlife habitat as a component of biological diversity will be maintained for a variety of species. As riparian areas represent primary habitat for over 75 percent of species on the Forest and Grassland, this represents a positive, significant effect on biological diversity.

Alternative E-Departure

Alternative E-Departure, with a short-term emphasis on high commodities production (especially timber), but with declining emphasis over time, will also reduce biological diversity, but substantially less than

legal guidelines allow, and also less than either Alternatives No Change or B-Modified. Wilderness, unroaded areas, old growth, and Research Natural Areas are represented with relatively large acreage allocations with this alternative, which provides a large reserve where natural processes are generally allowed to occur. Snag habitat for cavity nesters is maintained at high levels, with 55 percent of potential at the end of the fifth decade, but riparian in excellent condition is limited to 9.4 thousand acres, or about 50 percent of Alternatives B-Modified, I, or C-Modified. Within the intensively managed areas of the Forest, stand conversion of old growth to early successional stages occurs at a rapid rate, and with almost full dependence on even-aged management, meaning that diversity is primarily maintained horizontally, in contrast to uneven-aged management which tends to provide vertical diversity (if all successional stages are represented). Old growth allocations for dependent wildlife species are about 45 percent above minimum required for maintenance of viable populations, but no specific allowances for interconnective travelways between habitats is recognized.

Alternative A

Alternative A represents current direction, or "No Action" required by NEPA and is a basis for comparison with the other alternatives. It has been revised since 1979 (date of Decision Notice) to include management requirements to bring it in line with the National Forest Management Act (NFMA) of 1976, and therefore meets minimum acceptable levels for maintenance of biological diversity. Allocations to wilderness, unroaded, Research Natural Areas, and "excellent riparian" are limited (similar to B-Modified, except riparian, which is less in A), therefore providing a relatively small reserve where natural processes are allowed to occur, generally unimpeded. Snag habitat is provided at levels similar to B-MOD, E-Departure, and I (52 percent). Very little use of uneven-aged management is scheduled in this alternative, therefore minimizing visual and structural stand diversity provided through other alternatives such as B-Modified, I and C-Modified. Old growth is provided, but on a rotating, managed stand basis (as opposed to dedicated), which provides some level of risk that old growth conditions cannot be replicated through silvicultural means. Alternative A is just slightly better than Alternative B-Modified in terms of assuring maintenance of long-term productivity and biological diversity.

Alternative I (Preferred)

Alternative I is designed to provide a mix of commodities and public amenities as a response to public issues, concerns and opportunities, primarily from the local and state area. While Wilderness and Research Natural Areas are allocated at relatively large acreages, both old growth and unroaded area acreages are relatively small, representing a limited area where natural processes are generally allowed to occur. Maximum acreage of excellent riparian is an important aspect of this alternative, with additional mitigation for connective travelways provided for movement of wildlife species, especially between old growth habitats. This is significant in that it provides additional options for genetic exchange between wildlife populations, and raises the level of awareness for future management of this potentially critical habitat, which is not recognized in the other alternatives. Large acreages of uneven-aged management are provided within a mosaic of even-aged forested areas of varying rotation lengths; this represents increased diversity within the manipulated portion of the Forest over Alternatives No Change, B-Modified, and E-Departure, even though overall distribution of different successional stages is similar. Snag habitat is maintained at high levels, increasing over current levels to about 54 percent of potential in the fifth decade.

Alternative C-Modified

Alternative C-Modified probably provides the best representation of biological diversity (future maintenance) of all the alternatives (see Table 2-8, Chapter 2). This alternative provides the largest acreage allocations to Wilderness, unroaded areas, old growth, Research Natural Areas, excellent riparian (equal to B-Modified and I), retention and partial retention visual quality objectives, and snag habitat. No acres are allocated to fully intensive timber management practices, and forage production is reserved for use for big game and other wildlife. A more

equitable distribution of plant successional stages (forested) is provided over the long term than the remaining alternatives, therefore providing increasing options for management to deal with uncertain changes to the ecosystem. Large acreages of uneven-aged stand management are provided within a mosaic of well distributed even-aged stand and species types. High levels of both game and nongame wildlife species are provided, thus representing a major, critical component of diversity.

From a negative standpoint, infestations of serious insect and disease populations are more likely to persist over time with this alternative (see Effects on Forest Health, this chapter), because of the current and continuing habitat that this alternative provides (e.g. for spruce budworm, tussock moth). Increases in wildfire acreage and intensity is highly probable with this alternative, because of the large acreage of untreated natural fuels persisting over time. Mitigation of these two critical effects is possible (see Mitigation Measures, this section).

Indirect Effects

"Biological Diversity" relates to the distribution and abundance of different plant and animal communities and species; in essence this represents the total living ecosystem on the Ochoco National Forest and Crooked River National Grassland; therefore further discussions of indirect effects on the environment are unnecessary. Other effects discussions provided in this chapter (e.g. Wildlife and Fish, Old Growth, Soils, etc.) are in fact discussions about biological diversity, but are separated in order to provide specific insights into each of them as individual components.

Cumulative Effects

No quantitative analysis was completed to determine the cumulative effects of the alternatives on biological diversity. The Forest has instead chosen major indicators of diversity and developed quantitative and qualitative representations of these indicators. These include:

- Riparian Areas in Excellent Condition
- Riparian Areas Designated for Connective Habitat
- Snag Habitat for Cavity Nesters
- Existing Old Growth
- Acres of Forested Land by Successional Stage
- Acres of Nonforest Land by Plant Community Type
- Maintenance of Viable Populations of Sensitive Plant and Animal Species

The first six have been quantified and projected over the fifty year planning horizon. Table 4-3 displays these for decades 1, 2 and 5 of the planning period. The last indicator (viable populations) is not quantifiable, but instead represents a management objective (requirement) for all Forest and Grassland activities.

These indicators are probably inadequate to describe biological diversity in total because current knowledge concerning all components necessary for maintenance of diversity is also inadequate. There is, though, mounting evidence on an international scale that "keeping all of the pieces" (of the ecosystem) is essential for long-term production of goods and services to the public, as well as to life itself. All of the alternatives are designed to provide legally mandated levels of diversity; therefore, no significant, cumulative effects are predicted. The risk of initiating a future significant effect on biological diversity probably lies in the level of lands allocated (or more appropriately, not allocated) to nonhuman consumption or use. Based on this assumption, the alternatives can easily be risk rated by level of allocation to this function, as shown in Table 4-4.

TABLE 4-4

	ALTERNATIVE
Low Risk of Cumulative Effect	C-MOD I A E-DEP B-MOD
Lower Risk of Encounter	NC

TABLE 4-3
BIOLOGICAL DIVERSITY

		ALTERNATIVE					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Riparian Areas in Excellent Condition	M Acres						
Decade 1			10 0		10 0		10 0
2			11 2		11 2		11 2
5		5 4	17 5	9 4	17 5	5 4	17 5
Riparian Areas Designated for Connective Habitat	M Acres						
Decade 1		0	0	0	1 0	0	0
2		0	0	0	1 0	0	0
5		0	0	0	1 0	0	0
Snag Habitat for Cavity Nesters (Average across the Forest)	Percent of Potential						
Decade 1		*Unknown*	43	46	47	46	51
2		Unknown	41	50	49	52	59
5		Unknown	33	55	54	52	69
Existing Old Growth	M Acres						
Decade 1		93 8	93 8	93 8	93 8	93 8	93 8
2		80 0	80 6	82 5	83 9	73 0	85 8
5		40 0	42 4	55 0	55 1	53 0	78 2
Acres of Forested Land by Successional Stage							
Stage I and II (Grass forb/Shrub-seedling)	M Acres						
Decade 1		Unknown	9	9	9	9	9
2		Unknown	55	40	30	37	19
5		Unknown	45	41	34	43	21
Stage III (Pole sapling)	M Acres						
Decade 1		Unknown	146	172	151	170	138
2		Unknown	140	181	151	176	147
5		Unknown	69	88	63	106	42
Stage IV (Young)	M Acres						
Decade 1		Unknown	205	159	184	159	191
2		Unknown	167	127	192	123	158
5		Unknown	192	205	190	178	166
Stage V ((Mature)	M Acres						
Decade 1		Unknown	118	138	134	139	140
2		Unknown	129	142	115	151	162
5		Unknown	224	183	230	191	265
Stage VI (Old Growth)	M Acres						
Decade 1		Unknown	94	94	94	94	94
2		Unknown	81	82	84	84	86
5		Unknown	42	55	55	53	78
Acres of Nonforest Land by Plant Community Type							
Timberline Meadows	*M Acres*	*3450*	*3450*	*3450*	*3450*	*3450*	*3450*
Meadows	M Acres	16,850	16,850	16,850	16,850	16,850	16,850
Juniper Dominant	M Acres	137,650	137,650	137,650	137,650	137,650	137,650
Grass Dominant	M Acres	50,900	50,900	50,900	50,900	50,900	50,900
Sagebrush Dominant	M Acres	80,100	80,100	80,100	80,100	80,100	80,100
Biscuit Root Scabland	M Acres	12,550	12,550	12,550	12,550	12,550	12,550

Mitigation Measures

Fire has historically been one of the primary forces for change and diversity east of the Cascades (Hall, 1976). Without a thinning agent such as fire, most tree species tend to stagnate in a closed canopy condition, shading out much of the understory forbs and shrubs leading to a marked reduction in total species diversity and productivity (Volland and Dell, 1981). The diversity of plants is what drives the diversity of animals which depend on them for shelter and subsistence (Ream, 1981). Therefore, major reintroduction of fire into the ecosystem appears to be an effective way to recapture diversity, as represented by the "natural forest." But, conflicts with other resource objectives (e.g. air quality) will probably reduce its effectiveness, through significant limitations on burning. Within these limitations though, the Forest has developed prescribed burning prescriptions, designed to emulate natural fire frequencies by plant community type (see Standards and Guidelines, Appendix D, and Forest and Grassland Plans, Chapters 4).

Silvicultural prescriptions are also designed (where compatible with other resource emphases) to "reverse the successional trend" in forested stands. This includes (in some cases) the use of regeneration harvest on transitional plant community types, where fire exclusion has allowed non fire adapted species to invade (e g. white fir and Douglas-fir). Reforestation and stand maintenance with early succession species (such as ponderosa pine, western larch and lodgepole pine) is very effective in recapturing stand conditions indicative of presettlement times.

Conflicts with Other Plans and Policies

Other than Federal legal requirements (36 CFR 219.27) for maintenance of biological diversity, no specific objectives of Regional, State or local agencies are known to exist.

Cultural Resources

By comparing general resource activities (e.g., recreation, range, or timber) against their potential to "discover" or "impact" sites, the relative effects of the alternatives on cultural resources can be appreciated. Specific resource activities can have both a negative (destruction or removal) and positive (discovery) effect on cultural resources.

Effects to cultural resource sites include direct, indirect and cumulative impacts as the result of intentional and inadvertent damage (negative) to the cultural evidence left by past Forest and Grassland users.

Effects in general are the result of ground-disturbing activities. The risk of impacting sites is directly related to the amount of ground-disturbing activities conducted in a given area. The positive effects to the cultural resource program are: finding and protecting significant archaeological, historic and cultural sites; and increasing our knowledge of past Forest and Grassland users. These effects are reflected in the varying emphases of the alternatives.

The rate at which cultural resources will be depleted in the future (i.e., vandalized, lost to erosion, scientifically excavated) involves several factors. These factors include the timber and beef markets, recreational use of the Forest, funding levels, and academic research interests.

The following resource activities have been identified as possessing significant interactions with cultural resources: Recreation, range, timber, riparian, mineral and energy development, transportation, and fire (Bryant, 1982, Haase, 1983, Philipek, 1985, Schuster, 1984; and others).

Direct Effects

Direct effects which can threaten cultural resource sites are most often associated with road building, timber harvesting, trail and campground construction, reservoir construction, livestock trampling and the development of springs for human or livestock use.

Direct effects to cultural resources may be realized as recreational facilities are developed or expanded. The construction of campground facilities, reservoirs, boat ramps, or trails can disturb significant cultural resources, as these facilities are often associated with areas of higher site potential (e.g., meadows, springs, terraces, promontories, and ridgetops) Associated increases in recreational use of the Forest would result in additional visitors, increasing the potential for unauthorized collection of artifacts and excavation (looting) of sites. Incidents of vandalism, intentional or otherwise, would likely increase.

Positive effects associated with the expansion or development of recreational facilities would include a concomitant increase in opportunities to enhance and interpret significant cultural resource sites for public education and enjoyment.

Significant interactions between cultural resources and range-related activities are most directly associated with livestock levels, water developments, and mechanical treatment programs. For example, breakage or displacement of artifacts through trampling can be severe, depending on the number of livestock and the density of artifacts/sites. The development of springs and reservoirs for livestock use can impact cultural resources occurring in and around the developed areas. The relative stability of many seeps and springs, reflected in their recurring use by Native American as well as Euro-American groups, increases the possibility that significant sites may be adversely affected by such development activities.

Nonstructural range improvements include the use of prescribed fire, broadcast seeding, and chemical applications to reduce competition from non-palatable species. These practices are not necessarily threats to cultural resource sites. Prescribed burning can increase the effectiveness of cultural resource surveys by enhancing ground visibility in heavily vegetated areas. Similarly, water developments and mechanical treatment practices afford an opportunity to inventory additional acres in advance of the associated activities.

Excavations or impoundments to create stock watering reservoirs can have obvious effects on cultural resource sites, either through the excavation activity itself or in the resulting inundation of stream terraces. Mechanical treatment to enhance forage production, achieved through the use of heavy equipment, can generate substantial ground disturbance which threatens archaeological sites. Plowing, disking, drilling, pushing, piling, and chaining represent potential mechanical treatment practices.

Timber sale activities involve cultural resources more than any other Forest activity. Haul road and landing construction, tree felling, skidding, slash disposal, and tractor yarding are among those activities which have the potential to alter or destroy surface or shallow buried sites. Silvicultural treatment of timber sale areas may result in direct effects caused by increased ground visibility, presence of tree planting crews and ground disturbance by equipment. On the other hand, the timber management program results in direct positive effects on cultural resources; the inventory data base can be continually evaluated, with the goal of compiling sufficient data to support scientifically sound efforts at cultural resource site allocation and inventory design.

Stream alluviation can preserve, yet obscure, such sites by burying them under successive layers of alluvium. Streambank erosion can both expose and destroy buried sites which otherwise might not be observed. Cultural resource sites on this rather arid Forest are strongly associated with water. The management of riparian areas produces a positive direct effect of providing opportunities to inventory those drainages with significant terrace development and/or streambank erosion.

Mineral and energy development activities (geothermal and oil and gas exploration, placer or lode mining) would cause ground disturbance to areas with both historic sites (historic mines and districts) and archaeological sites. The remnants of early mining activities at the Mayflower, Amity, Blue Ridge, and Independent mines represent historic sites which may meet National Register eligibility criteria. Various treatment options (including mitigation measures) for these eligible historic sites would have to be considered prior to the resumption of mining.

The re-introduction of mining at levels even approaching historic work seems unlikely for the foreseeable future, however, any increase in mining activity would result in an increased likelihood of cultural resource site discovery and possibly degradation.

The effects of road construction on cultural resource sites are obvious. Because the major components of the Forest's transportation system are sometimes superimposed on historic and, to a lesser degree, prehistoric routes of travel, the likelihood of direct impacts to cultural resource sites is high. The development or improvement of transportation systems would increase the potential for cultural resource site discovery and degradation by land and resource users. As previously unroaded areas are entered, cultural resource inventories, once afforded a degree of de facto protection, would be threatened.

Brush disposal through controlled burning can result in direct impacts to the surface components of archaeological sites if the fireline intensity is high. Fire suppression and brush disposal activities can lead to the discovery of cultural resource sites by crews who may inadvertently or intentionally disturb them. Suppression of wildfires can adversely affect significant cultural resources. The emergency nature of these activities frequently demands an immediate response that may override traditional cultural resource procedures. Fire management activities can also have the positive direct effect of increasing the visibility of such sites, thus increasing our inventory and knowledge.

Effects by Alternatives

Highlights of the direct effects to cultural resources by the five alternatives include:

Alternative B-Modified

Potential effects to cultural resources will be increased as the timber harvest level is expanded to attain the timber outputs in the first decade (130 million board feet). Opportunities to inventory and evaluate cultural resource sites will increase. The relatively small number of range structural improvements (138) will limit associated effects. The high level of road construction (14 miles/year) would lead to the potential for increased conflicts with cultural resource sites.

Alternative E-Departure

Potential effects to cultural resources are associated with intensive timber management practices producing 123 million board feet in volume. A trail system with 132 miles of new trail and the projected construction of 138 range structural improvements will increase potential threats to sites while enhancing the Forest's site survey data. Corresponding emphasis on unroaded opportunities and big game outputs maintain anonymity (and thus, protection) of cultural resources. In general, opportunities to locate and evaluate cultural resource sites will be moderate.

Alternative I (Preferred)

The timber harvest level is moderate for the first decade at 123 million board feet. Opportunities to inventory and evaluate sites will increase in response to the range and timber emphases. The corresponding emphasis on unroaded recreation will afford a degree of site protection through continued site anonymity.

Alternative A

While intensive timber management practices will result in a harvest level for the first decade at the same level as Alternative I (123 million board feet), they do so without the component of uneven-aged management. Only 27 structural range improvements will be made and no new trails will be constructed. Overall, potential impacts to cultural resources will not differ significantly from the current situation.

Alternative C-Modified

This alternative would provide for the lowest timber volume of any alternative (94 million board feet). Similarly, annual AUM's would be reduced by 12 percent. The emphasis on obtaining excellent riparian conditions on 15,600 acres of land would increase the opportunity to inventory areas of generally high site potential (e.g., terraces). Elsewhere, the low levels of timber and range development would serve to insulate significant cultural resources from potential adverse effects. The potential for site vandalism would increase, as the trail system would be greatly expanded (e.g., 187 miles of new trail, first decade).

Indirect Effects

Direct effects to cultural resource sites caused by various ground-disturbing management activities would potentially reduce opportunities to enhance and interpret cultural resources. Recreational activities with some reliance on cultural resources or cultural heritage interests would be impacted if adverse effects to cultural resources were always mitigated through data recovery.

On the other hand, increased management activities can also provide opportunities for site treatments that result in increases in recreation opportunities with cultural resources, such as: interpretive and historic trails, reconstructed historic structures and interpretive signs and sites.

Range improvements in the vicinity of springs and seeps may be constrained by the treatment needs of cultural resource sites. Cultural resource values could reduce the opportunities for range improvements and capacities, but it is unlikely that it would be to a significant degree.

The availability of timber resources and their contribution to local and regional economies can be affected to a limited degree by the presence and treatment needs of National Register eligible cultural resource sites. Preservation in place or data recovery treatment of buried archaeological sites could result in limitations upon timber resources, silvicultural prescriptions and reforestation efforts.

The presence of cultural resource sites along streams and creeks could result in the enhancement or protection of alluvial terraces and other streamside features. In this case positive indirect effects could result to watersheds if cultural resources were preserved and stabilized in-place.

The availability of mineral and energy resources as contributors to local and regional economies could be affected by cultural resource values to a limited extent. The presence of National Register eligible historic mining and associated structures or cultural resource sites in proposed energy development areas or utility corridors may require treatments and mitigative measures that would slightly increase the cost of mining and energy development.

Significant cultural resource sites located in the proposed locations of new and reconstructed transportation systems, travel corridors and trails must be treated. This treatment can range from preservation in place through project modification and site avoidance to mitigation through complete data recovery of the site and its cultural resource values. In general these indirect effects would be felt by users of these transportation systems and would cause impacts to social and economic systems.

The indirect effects of cultural resource upon other Forest and Grassland resources not discussed above are considered to be minor to nonexistent and hence are not treated in this section.

Cumulative Effects

The cultural resource review and compliance process has provisions for the consideration of cumulative effects on National Register listed or eligible sites (cf., 36 CFR 800). Cumulative effects are associated with past, present, and reasonably foreseeable future actions (40 CFR 1508.7). With regard to cultural resources, cumulative effects can best be viewed as indirect effects which are later in time and farther removed in distance from a proposed undertaking (36 CFR 800.3(a)). They are more closely linked to changes in the integrity of a site's setting, feeling, or association, rather than to immediate site effects such as physical destruction or alteration.

Management activities which possess a greater potential to alter not only a site's physical integrity, but also its environmental setting or ambience, have a greater potential for cumulative effects on cultural resources. In this light, timber, fire, transportation, range and recreation have a higher risk in declining order of causing cumulative effects to significant cultural resource sites on the Ochoco Forest.

Mitigation Measures

Adverse effects to significant cultural resources will be mitigated through project redesign or data recovery. *Treatment of Archeological Properties - A Handbook* (ACHP 1980) will be used to guide the development of data recovery plans. Additionally, coordination with the State Historic Preservation Office (SHPO) and Advisory Council on Historic Preservation will be conducted as per 36 CFR 800, the Lithic-Dominated Sites Programmatic Memorandum of Agreement, and the Depression-Era Programmatic Memorandum of Agreement (see Standards and Guidelines, Appendix D).

A cultural resource inventory (survey) will be conducted prior to the initiation of any project activity which involves ground disturbance, regardless of the selected alternative. All sites will be evaluated against the National Register eligibility criteria. Adverse effects to significant sites will be avoided by project redesign or mitigated through the development of case-specific mitigation plans.

A variety of techniques can minimize or eliminate the adverse effects of timber harvesting on significant sites. These techniques include directional felling of trees, hand piling of slash, designation of skid trails, logging over snow, the construction of protective earthen padding over site areas in road corridors and, of course, avoidance of sensitive areas.

An opportunity exists to involve cultural resource specialists in planning responses to wildfire suppression needs. For example, the specialist can be consulted in planning the location of firelines, access roads, and base camps.

Similarly, the Forest Archeologist will be assigned to the Forest Fire Rehabilitation Team, thus affording timely cultural resource input following the destruction of vegetative cover.

Conflicts with Other Plans and Policies

Conflicts with the State of Oregon's comprehensive goals and priorities for historic preservation planning are not expected due to the review and compliance relationships between the Forest and Oregon SHPO as required by Federal law and policy regarding cultural resource management.

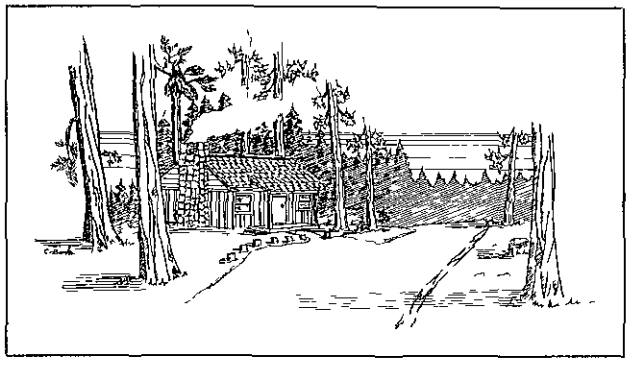
Conflicts can result with heritage/preservation plans issued by various Indian Tribes or Confederations holding ceded lands rights and privileges or cultural and religious interests in lands administered by the Ochoco National Forest and Crooked River National Grassland. However, consultation between the Forest and the respective Tribal Councils or their representatives will minimize or eliminate such conflicts.

Conflicts may arise between the plans and desires of local communities, county historical museums, Indian Tribes and the like over the treatment of cultural resource sites and the curation and storage of prehistoric and historic artifacts. However, such conflicts can be minimized or eliminated through the public comment and appeals process required for all cultural resource treatment and allocation decisions.

In some cases, planned increases in recreation development and facilities by the State of Oregon, other Federal Agencies or Counties can produce increased potential for direct and cumulative effects on cultural resources; however, no discrepancies are known at this time regarding cultural resources between the Forest and other agencies.

Facilities

On the Ochoco National Forest, facilities include buildings, water systems, and dams. Levels of construction and maintenance of these facilities was not varied by alternative in preparation of the Forest Plan. Instead maintenance will be guided in the implementation phase through the preparation of a Facilities Master Plan. Decisions on building acquisition, use and disposal of forest buildings will be documented in this Plan.



Water systems at recreation and administrative sites will be reconstructed as needed to meet the current State standards. Irrigation and Livestock watering dams will be maintained or improved, but no new structures are foreseen.

No significant direct, indirect, or cumulative effects are foreseen with these projects.

Fire

Assumptions and Interactions

Natural processes and management activities affect the amount and characteristics of wildfire and prescribed fire in the environment. Significant interactions affecting area burned and fire intensity are changes in:

vegetation;
residues,
ignition sources, and
control effectiveness.

Assumptions important to this discussion are:

Wildfire will burn approximately 7,500 acres per decade under all alternatives. The variation in acres burned from year to year is from less than 100 to over 4,000. It appears that any variation between alternatives would be insignificant in comparison to natural variation. Therefore, individual alternatives were not modeled and no differences between alternatives are being estimated.

Prescribed fire use and characteristics are affected by a wide variety of management practices related to wilderness, range, timber, wildlife, and hazard reduction. All use of fire directly relates to two principal goals: live vegetation management and dead vegetation (residues) management. The management prescriptions associated with the Forest Plan are the basis for the estimation of the amount of prescribed fire use.

Vegetative and Residue Changes

Vegetation change and residue manipulation affects local residue profiles. The fuel profile determines the character of fire in both intensity and the area burned. Vegetation and residue manipulation includes all aspects of utilization or control of the live and dead plant materials on the Forest. These include range and wildlife habitat improvements, timber management practices, firewood collection, and wildfire hazard reduction programs.

Ignition Sources

Ignition sources accompany human activities. Anything that can create a spark, flame, or excessive heat can start a fire under the proper fuel and weather conditions. Ignition sources from human activities increase the frequency of fire above natural levels causes by lightning. Ignition sources may include friction of a yarding cable across a punky log, sparks from a tractor track sliding on a rock, hot carbon particles from an exhaust, a cigarette, campfire, or arson.

Control Effectiveness

Control effectiveness depends on a variety of interrelated activities. These include: residues manipulation to retard the spread or intensity of wildfires, early detection to catch wildfires when they are small, suitable access to speed suppression response, and appropriate suppression response (both forces and strategies).

Direct Effects

Vegetation/Residue Changes

Table 4-5 displays the level of prescribed fire that will occur by the various alternatives. Fires will change the vegetation and residue profile of an area. This in turn will affect the character of future fires. Generally, burned areas will first be revegetated by herbaceous vegetation. This type of vegetation will result in future fires having rapid rates of spread, low fire intensities, and low resistance to control efforts. Thus, in those alternatives with a relatively large prescribed burning program, the extent of future wildfires may be greater. However, the amount of resource damage will be decreased.

Industrial operations source fires currently average five per year. They cause 75 percent of the human caused acreage loss and 90 percent of the dollar cost and loss. A change of one or two fires per year is all that is anticipated due to changes in operations activities among the alternatives. The average size of operations fires is 30 acres with a suppression cost of $40,000 and resource loss of $15,000.

Control Effectiveness Changes

No significant change in this is expected. The most direct effect of the alternatives on this subject is the lowering of average fire intensity through the reduction in average residue loading projected in the effects section on Forest Residues. Total residues remaining after treatments will decline from 16 to 19 percent by the fifth decade. This will translate into a similar reduction in average fire intensity. The improvement in control effectiveness, however, is almost equally offset by the expected increase in numbers of human-caused fires, mentioned above, and by an expected decrease in the amount of timber activity with its related residue treatment, personnel, and equipment. Both of these decrease control effectiveness.

TABLE 4-5
ANNUAL ACREAGE OF PRESCRIBED FIRE USED

	To Treat Natural Fuels				Percent Change from Natural Fire Levels 3/	
Alternatives	Hazard Reduction	Other 1/	To Treat Activity Fuels 2/	First Decade Total	First Decade	Long Term
NC	6800	5500	12900	25200	-9	-11
B-MOD	4100	7700	15900	27700	-1	NC
E-DEP	5200	6500	14100	25800	-8	-21
I	4900	7500	14200	26600	-5	- 1
A	6800	5500	12900	25200	-9	-11
C-MOD	4700	8500	13500	26600	-5	+ 4

1/ This consists of fuel treatment for a variety of management objectives in range, wildlife, and vegetation management and is not specifically related to fire hazard reduction

2/ Residue treatment (after timber harvest activities) to meet a variety of management objectives, but primarily related to fire hazard reduction

3/ Prior to the fire suppression activities of the past 80 years the natural fire level probably burned 28 000 acres annually This is based on a weighted average for the different vegetation types on the Forest and Grassland Current treatment levels range from 15 to 22 thousand acres per year

Ignition Source Changes

The largest change anticipated in ignition sources is expected in the increased recreation demand shown in Table 2-8, FEIS Chapter 2. This increased demand and use (11 percent to 381 percent depending on the category) is expected to increase human-caused wildfires from this source by approximately 50 percent. This is not a significant increase in total fire load. The Forest and Grassland experience about 10 fires per year due to recreation sources. Five more per year is only a five percent increase in the current total of 107 (includes 92 lighting ignitions per year).

Indirect Effects

Changes in extent and intensity of fire (wild or prescribed) in the ecosystems associated with the Forest and Grassland have significant effects on many resources, programs, and outputs.

Air Quality

This resource can be significantly affected by the amount of fire in the environment. See Effects on Air Quality, this chapter.

Biological Diversity

Fire has historically been one of the primary forces for change and diversity east of the Cascades (Hall 1976). In general, most tree species in the Blue Mountains province tend to stagnate in a closed canopy condition without a thinning agent such as fire. This condition shades out much of the understory forbs and shrubs leading to a marked reduction in total species diversity and productivity (Volland and Dell, 1981). The diversity of plants is what drives the diversity of animals which depend on them for shelter and subsistence (Ream, 1981).

The amounts of prescribed fire use projected in Table 4-5 come fairly close to that level experienced by the Forest historically. This should provide near normal levels of diversity provided fire is applied under a variety of intensities, in different times of the year, and with due regard to the site specific conditions.

Cultural Resources

There should be minimal effects on cultural resources of a prehistoric nature. Historic structures, however, could be destroyed. See Effects on Cultural Resources, this chapter.

Facilities

No significant effects are expected unless a prescribed fire escapes and threatens facilities. Fence lines and signs are the most likely affected.

Fire

Control effectiveness is not expected to change significantly over time for any of the alternatives. See Table 2-8, FEIS Chapter 2 (Fire). The reasons for this are the offsetting changes going on; an increase in ignitions and a decrease in residues from present levels.

Forage

The amount of fire (natural or prescribed) in the ecosystem has a significant effect on forage production and quality (Hall, 1976; Volland and Dell, 1981). Production increases for several years in grassland communities and for a few years in timber stands (depending on canopy cover). Palatability is increased also, but for a shorter duration than production increases.

Alternatives B-Modified, I, and C-Modified stay within five percent of historic fire levels, therefore coming close to natural forage rejuvenation cycles. Alternatives NC and A stay about 10 percent below historic rejuvenation cycles, providing lower production and quality of forage. E-Departure would drop from 8 to 21 percent below historic levels of rejuvenation.

Forest Residues

Other than utilization by society, levels of residues are controlled primarily by the amount of fire in eastern Oregon ecosystems (see Effects on Forest Residues, this chapter).

Alternatives B-Modified, I, and C-Modified stay within five percent of historic fire levels, therefore coming close to a natural level of residue recycling. Alternatives NC and A stay about 10 percent below historic recycling levels, providing higher levels of forest residue. E-Deperture would drop from 8 to 21 percent below historic levels of recycling and would provide the highest level of forest residues.

Fuelwood

The level of fire on the Forest and Grassland should not significantly impact the amount of fuelwood available, providing mitigating guidelines emphasizing utilization before disposal of residues are initiated.

Insects and Disease

Significant effects (both good and bad) can occur depending on the intensity and periodicity of fire in the environment. Too much fire intensity can injure trees, predisposing them to insect attack and/or disease entry. Too little fire can cause stand stagnation leading to insect attack and can allow significant buildup of diseases in decaying organic matter which

in turn can infect crop trees. Too little fire can also lead to invasion of stands by successional species not adapted to the periodic severe drought common east of the Cascades. Insect epidemics are common in these conditions, causing severe mortality and setting up excessive residue accumulations leading to severe stand replacement fires much hotter than would be the case under a more natural fire periodicity.

All of the alternatives have approached the use of fire with this in mind. Alternatives B-MOD, I, and C-MOD stay within five percent of historic fire levels therefore coming close to a natural level of fire periodicity appropriate for local ecosystems. Alternatives NC and A stay about 10 percent below historic fire periodicity. E-DEP would drop from 8 to 21 percent below historic levels of fire periodicity

Lands
No significant effects.

Minerals and Energy
No significant effects.

Old Growth
In the short term (the next decade or two) there should be no significant effects from the alternatives. However, given the current restriction on use of prescribed fire in these stands, residues will continue to accumulate to high levels. Douglas-fir and true firs will continue to replace ponderosa pine and larch, insects and disease will increase causing more mortality, drought will inevitably recur, and eventually an ignition will provide the start of a stand replacement fire which will be next to impossible to control within the old growth stand.

Periodic low to moderate intensity fire is the only way to maintain a stand of "Old Growth" ponderosa pine or to maintain ponderosa pine as a component of local mixed conifer stands. In either case, ponderosa pine will fade from the picture through mortality and lack of regeneration. The longer fire is excluded, the less chance of successfully reintroducing it without stand destruction.

Recreation
Fire affects recreation through effects on other resources such as forage, scenic resources, and wildlife and fish.

Scenic Resources
Short-term effects of fire are evident to forest visitors passing near recent fires of any kind. While most people are not pleased by the appearance of a burn during the first year or two, most are supportive of the use of fire to maintain open stand conditions and provide for the improvement of wildlife habitat. The visual variety provided by the Type One natural fire regime of this area (frequent fires of low to moderate intensity) has high scenic resource value (Bacon and Dell, 1985).

All of the alternatives have approached the use of fire with this in mind. Alternatives B-Modified, I, and C-Modified stay within five percent of historic fire levels therefore coming close to a natural level of fire periodicity appropriate for local ecosystems. Alternatives NC and A stay about 10 percent below historic fire periodicity. E-Departure would drop from 8 to 21 percent below historic levels of fire periodicity.

Social and Economic
No significant impact.

Soil
Fire is an important natural phenomena in local ecosystems. It provides a decomposer function to recycle nutrients from accumulating organic matter above ground back into the soil organic horizons for continued plant nutrition (Hall, 1976). Without this action, soil nutrient deficiencies begin to occur 100 to 150 years after the last fire. The reason for this is the local climate. It is dry, with long hot summers and long cold winters. Effective organic decomposition occurs during a relatively short period of the year (spring and fall). This situation allows the accumulation of site nutrients in dead and dying vegetation above the soil structure. The accumulation beyond the reach of roots continues until the stand stagnates. At this point soil nutrient stability is achieved

at a balance of slow uptake and slow return. The frequent return of fire in this system prevented soil nutrient deficiency and resulting stand stagnation by completing the oxidation process called organic decomposition.

Significant impacts are avoided by all alternatives through the amount of fire prescribed (approaching natural levels) and through mitigation measures incorporated into the alternatives.

Timber

Approximately half of the total prescribed fire (see Table 4 -5) projected in the alternatives is directly related to the timber program in the form of slash disposal after sale and silvicultural activity. While the estimates shown are primarily for hazard reduction purposes, Martin (1976) lists several silvicultural objectives served as well, including:

Provides site preparation for natural and artificial regeneration.

Removes barriers to planting.

Reduces vegetation competition.

Recycles nutrients into the soil.

Removes shelter from predators of animals destructive to seedlings.

Total acreage of activity fuels treatment using fire affects 90 percent of the sale activity acres in each alternative.

Alternative NC range is 12,500 to 14,600 acres per year.

Alternative B-Modified range is 12,900 to 16,100 acres per year.

Alternative E-Departure range is 9,500 to 14,100 acres per year.

Alternative I range is 9,300 to 15,200 acres per year.

Alternative A range is 12,500 to 14,600 acres per year.

Alternative C-Modified range is 12,800 to 16,100 acres per year.

Transportation

No significant effect.

Water

No significant effect as long as normal mitigation measures applicable to all alternatives are carried out to prevent erosion and minimize impacts on riparian zones (see Effects on Water, Mitigation Measures, this chapter).

Wilderness

Because of the importance of fire in local ecosystem dynamics (see preceding discussions), all alternatives have projected a near normal fire occurrence in the wilderness areas. This will range in periodicity from ten to a hundred years depending on the wilderness and its vegetation associations. In light of the small size of the areas and the continuous nature of fuels and vegetation between wilderness and surrounding areas, human ignition prescribed fire will be the option of choice until such time as a more natural mosaic of vegetation and fuel conditions exist inside and outside of the areas (FSM 2324.2). Once this is established, a more extensive use of natural ignition prescribed fire will be possible. When prerequisite prescribed fire planning has been accomplished for each wilderness plan, the application of appropriate prescribed fire can commence. In the meantime, all ignitions within wilderness on the Forest will be considered wildfire and will be suppressed using appropriate suppression response.

Wildlife and Fish

The effects of the prescribed fire levels on wildlife and fisheries will be driven by the effects on habitat structure already discussed in previous paragraphs. Alternatives E-Departure, NC, and A would have the least benefits for wildlife (but well within acceptable range). Alternatives B-Modified, I, and C-Modified would have the most benefits with regard to wildlife.

Cumulative Effects

There will be a gradual reduction in average fire intensity levels for wildfire and prescribed fire as the current residue loads return to more natural levels. This will lead to lower relative costs in both the use of prescribed fire and the suppression of wildfires.

Damage from wildfire will decrease as residue levels return to more natural levels.

Judicious use of prescribed fire will help return vegetation and residue levels to a more natural mosaic. This will in turn continue the existence of suitable habitat for local fauna and reduce the chances of catastrophic wildfire with higher than normal intensities and extent.

Biological diversity and site productivity will be maintained or improved through the maintenance of a more natural presence of fire in those ecosystems adapted to its presence.

Mitigation Measures

The following activities are proposed to prevent or ameliorate the adverse effects of too much or too little fire in the ecosystem.

Monitor the effectiveness of fire management direction (provided by the Forest Plan) in meeting resource needs. Make adjustments as needed based on running average analysis of the past two to five years experience to detect trends.

Maintain effective cooperative agreements with adjacent land managers to provide for cost effective resource protection and management through the sharing of current knowledge, skills, personnel, and equipment.

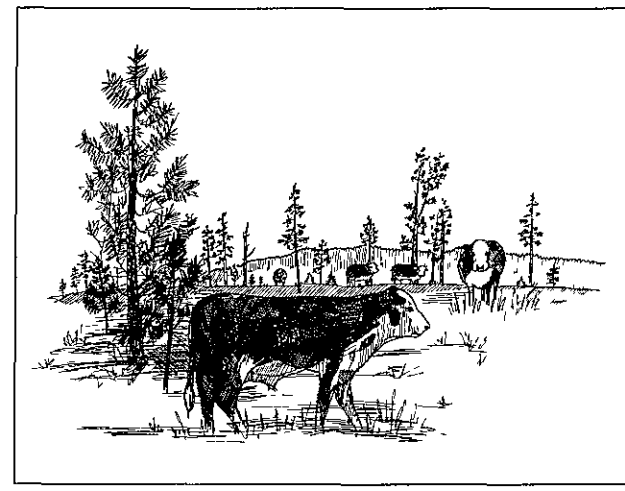
Improve residue utilization to reduce fuel loads, thereby reducing average intensity levels of prescribed fire, reducing expected damage from wildfire and also reducing costs of fire management through lower personnel needs.

Apply mitigation measures relating to prescribed fire use discussed under other resource area sections in this chapter (especially Air Quality, Forest Residues, and Soils).

Conflicts with Other Plans and Policies

There are no known conflicts with other plans and policies.

Forage and Livestock Use



Direct Effects

Forage production potentially increases with all alternatives as a direct result of timber harvest, nonstructural and structural range improvements, and prescribed fire (see Table 4-6).

Forage

Timber harvest opens up tree canopies, allowing sunlight to reach the ground, which increases forage production. In recent years, timber harvest has become more intensive with more overstory removal, shelterwood, clearcutting, and group selection. This has the potential to boost forage production more than "selective" harvesting (see Table 2-8, FEIS Chapter 2 Timber); these all are predicted to increase forage production over present levels. The degree of increase varies by alternative. Using total acres of harvest, the alternatives can be ranked in order of increasing forage production as: C-Modified, I, A, E-Departure, B-Modified, and No Change. Alternative A is higher than Alternative I, even though I has slightly more total harvest acres, because Alternative A has more acres in even-aged management. It is thought that acre for acre, even-aged management produces more forage than uneven-aged management. These projections do not take into account quality of forage, effects of grazing management, or other activities and uses on vegetation productivity.

Prescribed burning of natural fuels and range improvements (primarily juniper removal and prescribed burning) can increase forage production (Hall, 1976). Table 2-8 in Chapter 2 (Forage), shows acres of prescribed burning of natural fuels and acres of non-structural range improvement. However, it is assumed here that the most important influence on forage production is timber harvest, the ranking in order of increasing forage production shown above is unchanged even with the effects of prescribed burning and non-structural range improvements.

Grazing by domestic livestock removes forage and converts it to a commodity. Properly done, livestock grazing has minimal environmental effects. Likewise, use of forage or vegetation by wildlife or recreational livestock, or leaving it ungrazed for recreational purposes, contributes to important uses and enjoyment of the National Forests. Grazing effects diversity in plant communities and can effect species composition and conditions of plant communities. Properly timed, grazing will maintain and encourage a number of highly palatable and nutritious plant species in the community, and plant vigor will be high. Grasses will include a large proportion of perennial species that tend to decrease with improper grazing use. For many plant communities these would include blue bunch wheatgrass and idaho fescue. Shrubs and forbs will vary depending on the plant community.

Improperly done, livestock grazing can have adverse environmental effects. Repeated heavy grazing that is not properly timed can reduce species diversity and shift species composition toward greater undesirable species, and noxious weeds. Plant species diversity will be low, as will plant vigor. Annual grasses such as cheatgrass and perennial grasses that tend to increase with heavy grazing (i.e. sandberg wheatgrass), will replace the more desirable and palatable decreaser species. Forbs and shrubs will vary depending on the plant community. In some communities, grasses can be almost completely replaced by weedy forbs. Less desirable species result in lower productivity and can impact other uses on the Forest and Grassland. If the impacted areas are along streamsides and wet meadows, water quality, fisheries, and recreation can be affected.

Indirect Effects

The predicted increases in forage production have the potential to increase usable forage for livestock and wildlife, if proper management is done (see Mitigation). Livestock AUM's available for harvest by alternatives are shown in Table 4-7. As discussed above, AUM's are affected by differences in timber harvest acreages, non-structural range improvements and prescribed burning. Other factors that affect AUM's are differences in structural range improvements and riparian prescriptions (see Effects on Water, this chapter, and paragraph below).

Livestock Use

Analysis and modeling done for the Ochoco National Forest and Crooked River National Grassland has indicated that, theoretically, a forage surplus exists on a forest-wide basis after meeting the needs of both the game and livestock for each alternative. Therefore, it has been assumed that forage is not a limiting factor for big game numbers in any alternative. This is not to say that localized competition does not occur where livestock use has exceeded allowable use. Those localized situations are in fact recognized to exist, and are an effect resulting from intensive livestock use under extensive management systems.

Riparian prescriptions in the alternatives are designed to improve streamside conditions (see Management Prescriptions, Chapter 2). As conditions improve, they should produce more forage and increase plant species diversity with a larger variety of herbaceous and woody species. Along with the vegetation changes, improvement in the stream channels and water quality will result. Alternative B-Modified, C-Modified, and I have one riparian prescription which is designed to improve riparian conditions in all watersheds to "excellent condition." They will, therefore have similar effects on diversity, riparian condition, and forage production. Alternatives NC, A and E-Departure have two riparian prescriptions which will result in some watersheds having "excellent condition" riparian areas, and some watersheds having only "fair condition" riparian areas. The fair condition riparian areas would have less variety in herbaceous and woody plant species, which means less diversity. Channel conditions, water

TABLE 4-6
FORAGE

		ALTERNATIVE					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Potential Forage Production	M AUM s/Yr						
Decade 1		77 5	75 0	79 0	75 0	79 1	73 1
2		Unknown	82 0	78 9	81 5	78 9	73 3
5		Unknown	85 0	79 4	84 6	86 5	74 4
Structural Improvements	Number						
Decade 1		27	138	138	138	27	0
2		0	0	0	0	0	0
5		0	0	0	0	0	0
Nonstructural Improvements	Acres						
Decade 1		N/A	13097	12477	12832	12530	8760
2		N/A	4337	3717	4072	3770	0
5		N/A	4337	3717	4072	3770	0

TABLE 4-7
LIVESTOCK USE

		ALTERNATIVE					
Resource Output or Item	Unit of Measure	NC	B MOD	E DEP	I Preferred	A	C-MOD
Livestock Use	M AUM s/Yr						
1st Decade		77 5	70 0	79 0	70 0	77 5	73 1
5th Decade		77 5	80 0	79 4	80 0	79 1	74 4

TABLE 4-8
DIFFERENCES IN "EXCELLENT CONDITION" BY ALTERNATIVE

		ALTERNATIVE					
Resource Output or Item	Unit of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Riparian Areas In Excellent Condition	M Acres						
Decade 1			10 0		10 0		10 0
2			11 2		11 2		11 2
5		5 4	17 5	9 4	17 5	5 4	17 5

quality, and wildlife habitat would also be less desirable than for other alternatives. Table 4-8 shows the differences in "excellent condition" riparian, by alternative.

Increased forage production may have an indirect effect on wildfire hazards. Herbaceous vegetation that is not utilized by livestock and wildlife dries up in the latter part of the summer and becomes fine fuels. These fuels can increase the risk of fire and help fires spread (see Effects on Fire, this chapter).

Forage production has a direct effect on potentially available AUM's, which in turn has an indirect effect on the local economy, community cohesion and lifestyles (see Effects on Social and Economic Issues, this chapter). Since all alternatives have the potential to increase AUM's over time, these effects are mostly short-term in nature and reflect the changes the livestock grazing industry is faced with throughout the western U S. on public lands.

Cumulative Effects

Forage production will increase with the implementation of all of the alternatives, as discussed above. This is in itself a cumulative effect that results from a number of actions occurring over time on the Forest and Grassland. Availability of this forage for both livestock, wildlife and scenic resources will provide increasing, positive cumulative effects over the planning period. Any negative cumulative effects would result from improper allocation of this increasing resource to one or more uses at the expense of others. Based on the increasing level of concern from both management and the public about proper allocations of resources, this is unlikely to occur.

Because 50 percent of the riparian areas on the National Forest grazing allotments are in less than satisfactory condition, measures necessary for their recovery may result in temporary reductions in permitted stocking on those allotments with degraded riparian areas and poor range conditions. The reductions in permitted stock may effect the economics of the grazing operations on affected allotments, even though jobs associated with grazing in general are not expected to go either up or down (significantly) with any of the alternatives (see Direct Effects on the Social and Economic component of the environment, this chapter). But the long-term benefits of such actions are improvements in water quality, wildlife habitat, and forage production.

Mitigation Measures

Standards and guidelines are developed for each alternative (see Appendix D). These will be used in developing individual allotment management plans (AMP), which will ensure that livestock grazing is properly done.

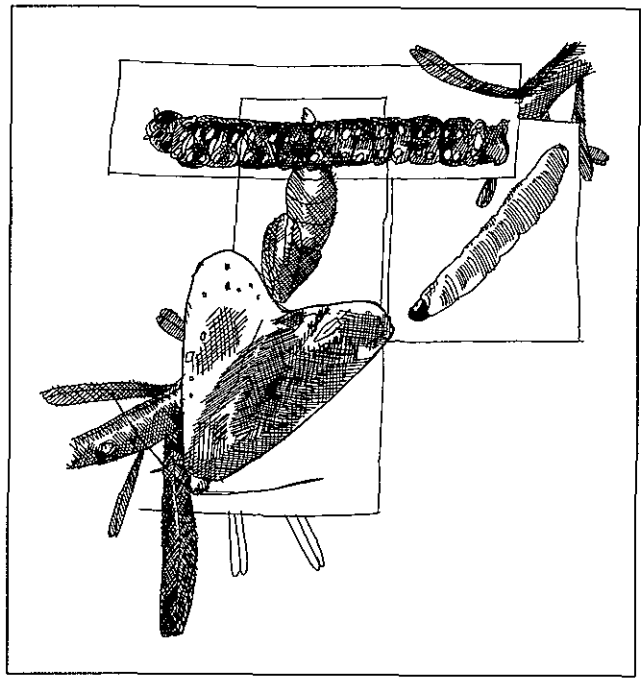
Forage utilization standards (Standards and Guidelines, Appendix D) identify what level of use can be made of forage while either maintaining satisfactory conditions or improving unsatisfactory conditions to satisfactory.

Application of intensive grazing systems such as rest rotation, deferred rotation, double rest, riparian pasture, holistic, etc., if properly done, provide for distribution and use of forage, while not exceeding utilization standards and all resource management objectives.

Timing of use by domestic livestock is used to meet vegetation management objectives.

Fencing can be used to exclude or better control use of domestic livestock or preferred areas that tend to get overused.

Monitoring of use and conditions will provide basis for adjustment of management and permitted stock where necessary to assure that grazing objectives and satisfactory conditions are achieved.



Forest Health

Direct Effects

Interactions

"Forest Health" is a condition where living and nonliving influences on the Forest and Grassland, (e.g. insects, diseases, atmospheric deposition, silvicultural treatments, harvesting practices, fire, interrupted plant succession) do not threaten management objectives either now or in the future. Deposition of air pollutants and potential changes in climatic conditions (e.g. the Greenhouse Effect) have tremendous potential for reducing forest health and therefore long-term productivity of associated resources (Knauer, et al, 1988). National concern for this issue resolves primarily around insects, diseases, and atmospheric deposition effects. It is beyond the scope of this analysis to discuss atmospheric effects, therefore, discussions revolve around those agents over which the Forest has some degree of control.

Fire plays a major role in maintenance of forest health on the Ochoco National Forest. Too much fire intensity can injure trees, predisposing them to insect and/or disease entry Too little fire interrupts natural ecological cycles in many plant communities on the Forest and Grassland, historically leading to tree stand stagnation or species conversions to undesirable species, also leading to insect or disease infestation. Insect epidemics, in particular, are common in these conditions, causing severe mortality, fuel accumulation, and eventually, stand replacement fires.

There are many naturally occurring organisms that have the ability to alter the forest environment. Of particular concern are those organisms that may negatively affect establishment and growth of trees. Most common of these are defoliating insects, bark beetles, fungal pathogens, dwarf mistletoe, small mammals, big game, and livestock. The risk of forest stand damage from these pests by implementing the alternatives through various management activities is discussed below.

Defoliators

Insects that consume tree foliage are called defoliators. Of particular concern are the western spruce budworm and the Douglas-fir tussock moth, both have produced Forest-wide epidemics in recent years. Host tree species (e.g. white fir and Douglas-fir) will increase as a result of natural regeneration on mixed conifer types, especially with a light harvest, which maintains shaded conditions favorable for those species (Hall, 1973; Minore, 1979, Seidel, 1979). This can contribute to increased defoliator populations and subsequent damage (Carlson, 1983). Other defoliators, such as larch casebearer are a concern but populations are not expected to change significantly as a result of selecting a particular alternative. Tree planting that emphasizes non-host tree species (pines and larch) may reduce defoliator habitat and damage to future stands. Both precommercial and commercial thinning may reduce height diversity in a stand, reduce the proportion of host species and maintain stand vigor, all of which may reduce damage from defoliators (Carlson, 1983). Harvesting of mature timber by clearcutting or shelterwood eliminates the habitat for defoliators and thus can reduce their populations. Small isolated timber harvest areas have little impact, but scheduled harvests over large acreages may significantly reduce populations by

reducing the proportion of host species and breaking up the continuity of desirable habitat (Carlson, 1983). Overstory removal can have similar effects if the host trees are removed. Selective harvests maintain host species in stands and create an uneven-aged condition which encourages the increase of defoliator populations and damage (ibid.).

Numerous natural controls play a part in regulating defoliator populations. Birds eat large numbers and are particularly effective in young stands (Garton, 1983; Wickman, 1981). However, as trees mature and conditions favoring defoliators improve, the effectiveness of birds in controlling defoliators decreases (Campbell, 1983; Carlson, 1983; Wickman, 1981).

Bark Beetles

Bark beetles are that group of insects that lay their eggs below the bark of host trees. The larvae tunnel and feed in the inner bark (Doliner, 1984). The interactions of management activities on bark beetles are:

The most effective control of damage from bark beetles is to maintain trees in a vigorous condition (Sartwell, 1976; Amman, 1977, Dolph, 1983). This can be accomplished through precommercial or commercial thinning. The degree of stocking required to maintain cover for big game (60 to 100 sq.ft./acre of basal area) may not maintain bark beetle resistant stands in pine types (Dolph, 1983).

Harvesting of mature and overmature stands, prompt salvage of infested trees and maintenance of non-susceptible species are other activities that can reduce bark beetles.

Bark beetle populations may continue to remain high but not necessarily epidemic in areas where control measures are not applied, such as in classified wilderness.

Root Rots and Stem Decays

This includes a variety of fungi or bacteria which cause diseases that infect the roots (root rot) or stem (stem decay) of host trees and cause growth loss, mortality of trees, or decay of sound wood. Loss in infested stands is estimated to be as high as 75 percent of normal growth (Filip, 1983). The following activities can affect the occurrence of root rots:

Natural regeneration in mixed conifer stands may result in an increase in root rots and stem decays in subsequent stands. This is based on the assumption that the new stand would be dominated by true fir (Seidel, 1979). Planting can reduce root rots and stem decays in future stands if resistant species are used (Seidel, 1981; Schmitt, 1984).

Clearcutting infested stands followed by regeneration with resistant species can reduce future incidence of root rots and stem decays (Filip, 1983; Dolph, 1980, Seidel, 1981). Shelterwood harvests can have the same effect as clearcutting if resistant species are used for reforestation, but infected shelter trees may provide a source for the new stand's infestation. Sanitation and salvage cutting can remove obvious infected trees, but increases likelihood for future occurrence of rots (Schmitt, 1984). Selection cutting may increase infestation from root rots and stem decays (Dolph, 1980, Schmitt, 1984; Filip, 1983).

Commercial and precommercial thinning can reduce root rots and stem decays by removing infected or wounded trees, increasing the proportion of resistant species, and maintaining stand vigor in some cases (Dolph, 1980; Roth, 1977). However, care must be taken to prevent injury to residual trees or the benefits of thinning may be lost (Aho, 1977; Dolph, 1980).

Forest stands with little or no timber management activities would have endemic levels of fungal activity similar to what presently exists except when wildfires occur, reducing the number of more susceptible tree species, such as those that occur in true fir stands.

Dwarf Mistletoe

Dwarf mistletoe damages the host by reducing growth, lowers wood quality, and kills or predisposes its host to attack from other pests (Graham, 1967). Dwarf mistletoe on ponderosa pine and Douglas-fir is of primary concern on this Forest. The following section discusses the timber management activities that may occur in the alternatives considered and the activities' effect on dwarf mistletoe.

Reforestation by planting or natural regeneration can reduce dwarf mistletoe by removing infection sources (Dolph, 1980), selecting resistant species (Seidel, 1981), and creating an even-aged stand (Barrett, 1979). Planting is usually more successful than natural regeneration to reduce mistletoe because of more control over these factors.

Clearcutting is an effective way to eliminate dwarf mistletoe in a forest stand as it removes the infection source (Dolph, 1980; Seidel, 1981). Shelterwood harvests with later overstory removal can reduce dwarf mistletoe infestation if the overstory is removed before regeneration is three feet tall (Dolph, 1980). Sanitation and salvage harvests in mature stands to reduce mistletoe have not been effective. In fact, repeated sanitation and salvage cutting creates a multiple-aged condition which can favor the spread of dwarf mistletoe (Barrett, 1979). Selection harvest also creates multiple or uneven-aged conditions which tend to promote spread of dwarf mistletoe (Seidel, 1981; Barrett 1979).

Both precommercial and commercial thinning are effective methods of removing dwarf mistletoe-infected trees. Thinned ponderosa pine stands sometimes outgrow the vertical spread of dwarf mistletoe (Barrett, 1985).

Small Mammals

Small mammals that damage trees include rodents such as rabbits, pocket gophers, ground squirrels, mice, voles and porcupines. These animals feed on tree seedlings and seeds, directly affecting reforestation of an area. Some interactions are:

Timber harvesting tends to increase small mammal populations as it increases the abundance of ground vegetation on which many feed (Stoszek, 1976). Even-aged management especially increases the amount of food available for small animals, such as pocket gophers, which have caused serious damage in plantations.

Scarification or broadcast burning for site preparation will temporarily reduce all or part of the above habitat (Stoszek, 1976, Crouch, 1976). As a result, populations may change locally, but the overall effect on total small mammal populations over time is expected to be insignificant.

Comparisons of Alternatives

Defoliators

Research literature is compelling towards use of management prescriptions that utilize even-aged management (in mixed conifer) and the use of prescribed fire for control of defoliators The objective is to "reverse the successional trend" created by nearly a century of fire suppression, selective harvesting (without proper follow-up cultural practices), and an overall lack of awareness of ecological principles. Significant outbreaks of defoliators have occurred recently, and will in all likelihood continue in the future. The long-term effects are unknown, but if predictions are accurate, recurring large scale defoliations will be common until forest stands are brought under an "integrated pest management" strategy. Effects will probably be cumulative.

Alternatives No Change and B-Modified would be most effective in reducing losses to defoliators because of the large number of acres treated, followed by A, E-Departure, I and C-Modified. But all of these alternatives would provide significantly reduced risk over the situation today.

Bark Beetles

Alternatives No Change and A are probably the most effective at reducing the risk from bark beetle damage, followed by B-Modified and I. E-Departure would be lower because of the larger acreage with big game emphasis, and Alternative C-Modified would have many acres at high risk from bark beetles.

Root Rots and Stem Decays

All alternatives would be effective in reducing these risks from root rots and stem decays in lands managed for varying levels of timber production. Alternative No Change, A or E-Departure would be most effective. Other alternatives (B-Modified, I, and C-Modified) would also reduce damage below today's level but probably not as effectively because of the amount of uneven-aged management.

Dwarf Mistletoe

Alternative No Change, A or E-Departure would be most effective for prevention of dwarf mistletoe. Alternatives B-Modified, I, and C-Modified would also reduce damage below today's level, but probably not as effectively as other alternatives because of the amount of uneven-aged management.

Small Mammals

Animal damage from small mammals will probably increase with those alternatives that emphasize even-aged management (especially clearcutting and shelterwood harvesting). The alternatives can be ranked according to the risk associated with this interaction as follows:

High Risk
- Alternative B-Modified
- Alternative No Change
- Alternative A
- Alternative E-Departure
- Alternative I
- Alternative C-Modified

Low Risk

Indirect Effects

Maintaining a healthy forest condition provides numerous positive benefits; recent (1987) Congressional Appropriations hearings on the Forest Service surfaced increasing public concern about maintenance of healthy forests to insure long-term production of many benefits, including timber, scenic resources, wildlife habitat and others (Knauer, et al, 1988). Likewise, conditions favoring an "unhealthy forest" reduce these same resource potentials.

Stagnate stands of ponderosa and lodgepole pine are predisposed to attack by bark beetles. When this occurs, cover for wildlife is reduced or eliminated, visual quality is lowered, and timber productivity temporarily foregone. These affects will many times last until the stand is either naturally or artificially (planted) regenerated, and has grown for fifteen to twenty years, at least. This is an irretrievable loss of that particular resource value for an extended period of time.

Defoliation by spruce budworm, tussock moth and others can last up to ten years or longer. Similar effects to bark beetle damage occur except that it usually is temporary (tussock moth causes more mortality) and wildlife cover is not eliminated. Loss of timber productivity and reduction of visual quality are the primary indirect affects from defoliation.

Root rots and stem decays tend to increase with poor timber management practices (such as excessive tree damage during logging and slash piling) and tend to affect that resource the most. Innoculum built up in stands occurs over time and the affects are slow and incessant; many times these affects are not noticeable to the untrained observer until epidemic levels occur. Cover for wildlife will be reduced over time, even though during initial infection stages, this affect is minimal. Without management, monitoring, and treatment of root rots and stem decays, timber stands eventually "fall apart," eliminating timber, wildlife and scenic values.

Dwarf mistletoe (a parasite) also builds up to damaging levels at a relatively slow rate, and death of trees occurs after long periods of time, depending on the species which is infected. Again, only severe damage is noticeable to the untrained observer, but affects are long lasting, and when serious, only relieved with stand regeneration. The major indirect affect is on timber production, but with long lasting infestations, visual quality, wildlife cover, and other resource values are reduced.

Cumulative Effects

During conditions where populations are above normal, all of the organisms discussed under "Direct" and "Indirect Effects" (with the exception of small mammals), are symptomatic of forest stand conditions that are not in line with natural processes on the Ochoco National Forest. Changes in major species composition (as the result of exclusion of fire) have created conditions favorable for these organisms to flourish, and cumulatively there is substantial long-term risk to management objectives, including timber production, wildlife cover, visual quality and outdoor recreation. In some mixed conifer stands, dwarf mistletoe, root rots, and spruce

budworm have been found together, causing stand damage to the point where the only option is to replace the stand with species adapted to site conditions (ponderosa pine, western larch and lodgepole pine). In some pine stands, dwarf mistletoe can predispose trees to attack by bark beetles, creating cumulative stand damage.

Computer models are available to predict damage from individual organisms (and to some degree, multiple organisms) over time. But, the ability to predict the overall cumulative effect of these organisms on the Forest resources is low. Based on available information, the alternatives can be ranked in terms of their risk of maintaining conditions favorable for cumulative, negative effects on forest health. Assumptions are: 1) wilderness and unroaded areas, where use of fire for forest stand maintenance is not an integral part of management, will provide future "breeding areas" for defoliators, bark beetles and dwarf mistletoe. Stem decays will also be prevalent, but root rots will probably stay at low, endemic levels, 2) the Forest will maintain sufficient quality control in treated stands to minimize infestations, which will hold true for all of the alternatives, 3) those alternatives which emphasize uneven-aged management will have a higher risk of sustaining higher levels of defoliators, dwarf mistletoe, and root rots; and 4) alternatives with higher timber harvest schedules will treat more acres in the short term, therefore reducing habitat for major insects and diseases (assuming that #2 holds true). The ranking by alternative is:

High Risk
- Alternative C-Modified
- Alternative I
- Alternative E-Departure
- Alternative No Change
- Alternative A

Lower Risk
- Alternative B-Modified

Mitigation Measures

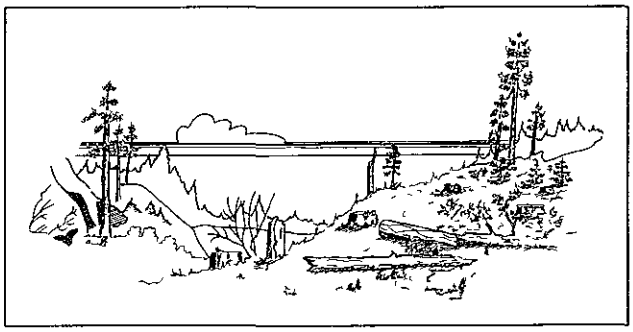
There is a risk of insects and/or diseases increasing to epidemic populations in large blocks of mature or overmature timber (such as in wilderness or old growth areas) and in situations where single species (monocultures) dominate stands. This risk can be reduced by managing adjacent stands for maximum resistance, i.e. resistant species, low densities, young age classes, and maintaining a diversity of species.

The following practices are used to reduce the damage resulting from root rots and stem decays: favoring resistant species (Schmitt, 1984), managing stands to rotation ages of 125 years or less (Aho, 1977), and treating stumps in areas of known infestations (Schmitt, 1984). These measures may be moderately successful except in severely infested stands. In the latter situation, natural regeneration should not be done if timber production is a goal (Filip, 1983).

See Standards and Guidelines for Forest Health (Appendix D) for additional mitigation measures.

Conflicts with Other Plans and Policies

There are no known conflicts with other plans or policies. There is a possibility of conflict with state or private agencies in control of future defoliator outbreaks on areas adjacent to wilderness or roadless areas, as it may not be cost effective for the Forest Service to spray these areas. If they were not sprayed they would provide a reinfection source for adjacent lands. This is a likely situation with the Lookout Mountain area, as it borders privately owned timber lands.



Forest Residues

Direct Effects

Projected levels of forest residues on the Forest are shown in Table 2-8, Chapter 2. All alternatives show a gradual decline over time. The differences between alternatives are negligible. The same table shows a comparison between alternatives on how forest residue levels would relate to the desired residue level for maintenance of long-term site productivity. Tables 4-9 and 4-10 expand on that analysis.

Alternative No Change

By the fifth decade, total pretreatment residues will have declined 17 percent compared to the present levels. Residues in excess of site needs will have declined by 35 percent. Total residues remaining on site after treatments will have declined by 17 percent and will be approximately 25 percent greater than needed for long-term site productivity.

Alternative B Modified

By the fifth decade, total pretreatment residues will have declined 13 percent compared to the present levels. Residues in excess of site needs will have

TABLE 4-9
FOREST RESIDUES
Percent of Desired for Long-Term Site Productivity

	ALTERNATIVES					
RESIDUE LEVEL	NO CHANGE	B-MOD	E-DEP	I Preferred	A	C-MOD
PRETREATMENT						
Current	191	191	191	191	191	191
Decade 5	159	165	156	164	159	163
POST TREATMENT						
Current	151	151	151	151	151	151
Decade 5	125	126	127	126	125	122

TABLE 4-10
Forest Residues in Excess of Long-Term Productivity Needs
(Thousand Tons)

	ALTERNATIVES					
RESIDUE LEVEL	NO CHANGE	B-MOD	E-DEP	I Preferred	A	C-MOD
PRETREATMENT						
Current	9,430	9,430	9,430	9,430	9,430	9,430
Decade	6,098	6,800	5,842	6,692	6,098	6,598
POST TREATMENT						
Current	5,330	5,330	5,330	5,330	5,330	5,330
Decade 5	2,588	2,670	2,852	2,724	2,588	2,264

declined by 28 percent. Total residues remaining on site after treatments will have declined by 17 percent and will be approximately 26 percent greater than needed for long-term site productivity.

Alternative E-Departure

By the fifth decade, total pretreatment residues will have declined 18 percent compared to the present levels. Residues in excess of site needs will have declined by 38 percent. Total residues remaining on site after treatments will have declined by 16 percent and will be approximately 27 percent greater than needed for long-term site productivity.

Alternative I (Preferred)

By the fifth decade, total pretreatment residues will have declined 14 percent compared to the present levels. Residues in excess of site needs will have declined by 29 percent. Total residues remaining on site after treatments will have declined by 17 percent and will be approximately 26 percent greater than needed for long-term site productivity.

Alternative A

By the fifth decade, total pretreatment residues will have declined 17 percent compared to the present levels. Residues in excess of site needs will have declined by 35 percent. Total residues remaining on site after treatments will have declined by 17 percent and will be approximately 25 percent greater than needed for long-term site productivity.

Alternative C-Modified

By the fifth decade, total pretreatment residues will have declined 14 percent compared to the present levels. Residues in excess of site needs will have declined by 30 percent. Total residues remaining on site after treatments will have declined by 19 percent and will be approximately 22 percent greater than needed for long-term site productivity.

Indirect Effects

Changes in residue levels brought about by the alternatives have the following significant indirect effects on other resources, outputs, and programs:

Air Quality

As residue levels decrease through time (see Chapter 2, Table 2-8) the amount of excess residues to remove from the land will be less. This is one of the major factors in the reduction of smoke emissions from prescribed burn treatments of these residues (see Chapter 2, Table 2-8, Total Suspended Particulates Output).

Biological Diversity

The kind and quantity of woody biomass residues on the land have a significant effect on the types of flora and fauna able to exist on or utilize the land (Harvey, et al, 1987; Hall, 1976). While the levels of residues will be decreasing, they will remain well above the levels required for maintenance of long-term site productivity (see Tables 4-9 and 4-10).

Cultural Resources

The gradual reduction in residue levels will allow for lower impact disposal methods (less mechanical and lower intensity prescribed fire) in the future. In the meantime, the amounts of residue present tend to hide cultural resource sites (this can be good or bad) and the treatments may be more likely to damage the sites.

Facilities

No significant effect.

Fire

Levels of dead woody residues have a significant effect on fire intensity and the resultant effects on the environment (Hall, 1976; Boyer and Dell, 1980; Volland and Dell,1981). See Effects on Fire, this chapter, for a detailed discussion on fire effects. Given the projected decline in average residues with time (see above) fire intensities should decrease over time. This will have a further effect of lower suppression costs and lower damage from wildfire. Prescribed fire should become less intense, as well as easier to apply.

Forage
Forage type, amount, and quality are affected by the level of forest residues. The reduction in residue levels will make more space available to above ground growth of forage species. Most of the nutrients from those residues burned will return to the rooting zones and be available for reuse more quickly than through organic decay in our dry climate. Careful maintenance of sufficient decaying woody material in the organic soil horizons will provide nutrient storage sites for the recycling nutrients (Harvey, et al, 1987). See further discussion of nutrient cycling effects under Soils in this section and in the Soils section of Chapter 4.

Forest Health
Decaying forest residues provide a pool of insects and decay organisms that can harm, as well as benefit the forest (Harvey, et al, 1987) The desired residue levels in this Plan provide a balance between the positive and negative contributions to forest health. The gradual return toward the desired level (see Table 4-10) is a deliberate attempt to avoid taking off too much residue until better information is available for this Forest.

Fuelwood
The reduction in excess residues forecasted will gradually approach the demand levels for fuelwood.

Lands
No significant effect.

Minerals and Energy
No significant effect.

Old Growth
No significant effect beyond those discussed in Effects on Biological Diversity, Soils, Wildlife and Fish, this chapter.

Recreation
Dispersed recreation areas will see a gradual reduction in levels of residues as part of the return to more open, park-like stand conditions where prescribed burning and other treatments have occurred.

Scenic Resources
See Recreation in previous paragraph.

Social and Economic
The excess residues shown in Table 4-10 indicate a potential utilization resource available to the local communities in the form of a variety of miscellaneous wood products and fuel wood supply. The amount available will decline over time as shown in all alternatives.

Soil
Levels of dead, decaying forest residues are extremely important to the physical structure of the soil as well as the associated nutrient cycling from the soil to living plants, to dead organic matter, and back to the soil (Harvey, et al, 1987; Boyer and Dell, 1980). The last step occurs through oxidation of dead organic matter by either slow organic decay or by the rapid process of fire.

Erosion prevention is another important function of forest residues in that they intercept precipitation and reduce overland flow of water. The declining levels of residues in the alternatives remain well above the levels considered necessary for maintenance of the above factors important to long-term site productivity.

Timber
Timber stand regeneration is affected in a number of ways by the levels of forest residues remaining on site (Harvey, et al, 1987). The forest residue levels projected in the alternatives provide moderate barrier potential to tree planting while still providing an abundance of shading material and future decayed wood material important for moisture and nutrient reserves, and mycorrhizal activity sites.

Transportation System
No significant effect.

Water
Residue levels affect the hydrologic cycle of a forest through interception by above ground debris, and through percolation rates modified by soil organic matter (Harvey, et al, 1987). The levels of residues projected should maintain more than adequate amounts to maintain soil characteristics in support of clean water production from the Forest.

Wildlife and Fish

Forest residues are an important part of both wildlife and fisheries habitat. They function as shelter and food sources for a large variety of terrestrial, avian, and aquatic fauna (Pierovich, et al, 1975). See Wildlife section of this chapter for further discussion. The projected residue levels in all of the alternatives will provide enough material to meet anticipated needs.

Cumulative Effects

Cumulative effects of changes in levels of forest residues will be expressed through discussions in a variety of other resources and programs including:

Air Quality
Biological Diversity
Fire
Forage
Forest Health
Fuelwood
Soil
Timber
Water
Wildlife and Fish

Detailed discussions on cumulative effects related to the above resource and program areas incorporate the expected levels of forest residues implicitly or explicitly.

Mitigation Measures

The Pacific Northwest Region of the U S. Forest Service has provided broad direction concerning the proper consideration of the retention, use, and disposal of forest residues (FSM 2403, R6 SUPP 345, 3/85). In summary:

Forest residues will be managed as a resource important to long-term productivity. With this in mind:

Retention on site is the first consideration.

If there is more material than is needed for long-term productivity considerations, utilization of excess is the next consideration

If there is still excess material on the site, the third priority is disposal.

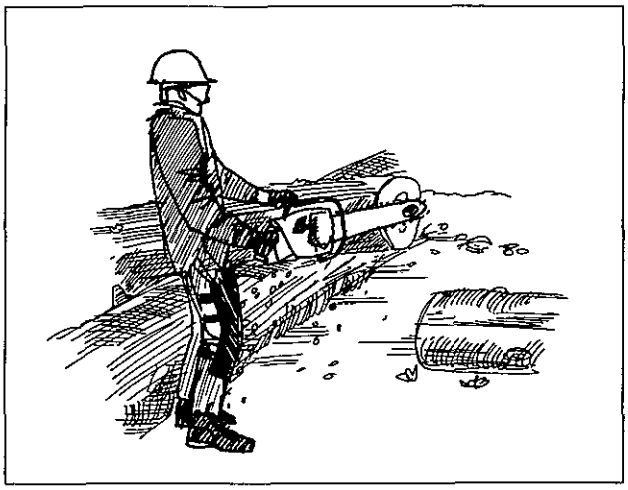
Disposal methods will consider costs, impact on site and resources, and ability to meet a variety of resource objectives.

In response to this direction the Forest is formalizing a Residue Management Plan which will ensure that project level planning will take into account the above considerations.

Conflicts with Other Plans and Policies

There are no conflicts with the plans and policies of other agencies or adjacent land owners.

Fuelwood



The public considers the harvesting of fuelwood an issue on the Ochoco National Forest. The record number of permits issued for firewood was 7,361 in 1981; this has declined to less than 6,000 cords in 1984. Future demand is uncertain, but is directly related to local employment levels and energy prices. The major source of fuelwood currently is the cull material left after logging operations.

Direct Effects

The availability of fuelwood is related to the timber harvest level. In addition to providing cull material at the landing, the timber program also builds and opens roads which improves access to natural mortality in timber stands. Consequently, the alternatives with the highest timber harvest level provide the most available fuelwood. The levels of fuelwood production by alternative are displayed in Table 4-11. As can be seen, availability exceeds current demand for all alternatives through the fifth decade, even though the quality of firewood may be reduced Large diameter, standing or fallen dead firewood will become harder to find and publics will have to depend more on residues from slash piles, etc., which may be small diameter limb wood. State and federal air quality concerns may reduce the desirability of firewood use in the future, or at least make it less desirable economically.

Indirect Effects

As traditional fuelwood becomes harder to find, more people may switch to other sources of heat or obtain more fuelwood from commercial sources. People may shift fuelwood demand to the Deschutes National Forest because of the extensive supplies of quality, dead lodgepole pine.

The falling of snags for fuelwood may effect the populations of cavity nesting species but standards and guidelines (Appendix D) are designed to protect habitat for these species, regardless of the alternative. The alternatives provide for different management allocations for snag habitat, and those with lower allocations exhibit more risk of serious impacts from firewood gathering violations. Table 4-12 displays snag habitat allocations for the different alternatives over the planning period. Alternative B-Modified (and probably No Change) contains the

TABLE 4-11
FUELWOOD

		ALTERNATIVE					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Fuelwood	M Cords/Yr						
Decade 1		140	150	131	130	140	120
2		124	140	123	120	124	100
5		116	130	100	110	116	90

TABLE 4-12
SNAG HABITAT FOR CAVITY NESTERS

		ALTERNATIVE					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C-MOD
Snag Habitat for Cavity Nesters (Average across the Forest)	Percent of Potential						
Decade 1		Unknown	43	46	47	46	51
2		Unknown	41	50	49	52	59
5		Unknown	33	55	54	52	69

highest level of risk in the long run, due to the relatively low level of snag habitat projected in the fifth decade (33 percent). The minimum level for sustaining viable populations of cavity nesters is 20 percent, so none of the alternatives (including B-Modified) are considered to have serious affects on snag habitat.

Although fuelwood collection reduces the total suspended particulates from slash disposal operations, particulates increase in the towns where the fuelwood is consumed. Currently, no restrictions have been applied to consumers by the State regarding wood stove use in the Forest's zone of influence. But, because of precedence in other communities in the state, it can be assumed that regulation of wood stoves will occur in the future.

Cumulative Effects

The cumulative effects of the timber harvest program in all alternatives will result in a reduction of size and amount of cull material available. Also, as stands are brought under management, the amount of natural mortality will decrease. Consequently, other lands (private or public) may serve as the supplier for the fuelwood consumer. No significant indirect effects (cumulative) are predicted, including those potential effects on cavity nesters as standards and guidelines are designed to maintain habitat well above minimums (20 percent).

Mitigation Measures

The Forest can make more material available through leaving roads open longer or allowing fuelwood cutting instead of precommercial or early commercial thinning. This is an administrative process that could be done with any alternative, but may conflict with other objectives including road closures for wildlife, soil protection and maintenance.

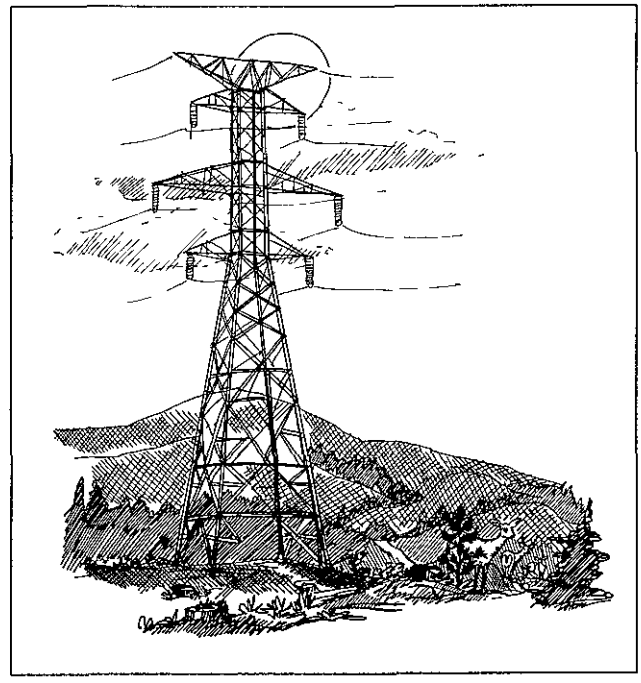
The Forest fuelwood program prohibits cutting of dead, standing trees (except for lodgepole pine) and should prevent most falling of snags for the benefit of cavity nesters, therefore reducing the indirect effects on this other important resource. But, based on experience, there will still be some unauthorized falling of dead trees, particularly western larch snags.

If urban air quality becomes an issue in the future, the Ochoco National Forest will cooperate with restrictions applied by State or County governments regarding fuelwood use as a means of mitigating indirect affects on air quality.

Conflicts with Other Plans and Policies

There are no known conflicts with other plans or policies.

Lands



Under all alternatives, the land exchange program will result in a more consolidated land ownership pattern, reduced administrative costs and fewer trespasses. Because land exchanges account for only a small change in the number of acres managed by the Forest and Grassland, this activity does not constitute any significant environmental effects, either directly, indirectly or cumulatively.

Special Use Permits

Direct Effects

Special use permits are issued for a variety of uses and activities on the Forest and Grassland (see FEIS Chapter 3). The different alternatives (NC, B-Modified, E-Departure, I, A And C-Modified) emphasize different mixes of resource outputs, including those that may require special use permits (e.g. outdoor recreation events). Selection of one alternative over another may result in a shift in the types of special use permits requested of the Forest, because of the long term shift in resource emphasis that certain alternatives exhibit. For example, Alternative C-Modified emphasizes amenity-oriented resource outputs such as developed, dispersed and backcountry recreation; this could ultimately result in an increase in recreation-type permits. In contrast, Alternatives NC and B-Modified emphasize commodity-oriented outputs such as timber harvest and livestock grazing. Special use permits would probably tend to follow a more utilitarian approach with these alternatives, simply because the Forest would (in the long term) become less desirable for extensive recreational use; the Forest and Grassland would appear more manipulated. But none of the alternatives have been designed to specifically exclude different uses of the Forest; all have been prepared in a framework of multiple use. Therefore, no significant direct effects on the special use permit system are anticipated

Indirect or Cumulative Effects

Issuance of special use permits for utility corridors (powerlines and energy transmission), can have significant indirect effects on other resources. Land is many times taken out of production from other uses, or at least reduced in terms of availability. None of the alternatives propose additional utility corridors for the foreseeable future. Any proposals for this use would require analysis through revision or amendment of the selected alternative. Therefore, no significant indirect (or cumulative indirect) effects are anticipated.

Mitigation Measures

Standards and guidelines (Appendix D - Lands) stipulate measures to take in order to mitigate the effects of actions on other resource values (indirect effects). Central to these measures is that any proposed action must be consistent with emphases associated with individual management areas; this applies to issuance of special use permits as well (including utility corridors). All applications for permits must be reviewed through an interdisciplinary process in accordance with NEPA regulations.

Mitigation measures for pipelines, power lines and phone lines may include:

Erosion control (minimum clearing widths);

Revegetation (primary with grasses and other noninterfering vegetation;

Removal of hazard trees along right-of-ways;

Construction of diversions or settling ponds near water crossings, or limit construction to specific seasons;

Location or camouflage to mitigate visual affects on the landscape; or

Restriction of off-road vehicles to limit soil erosion.

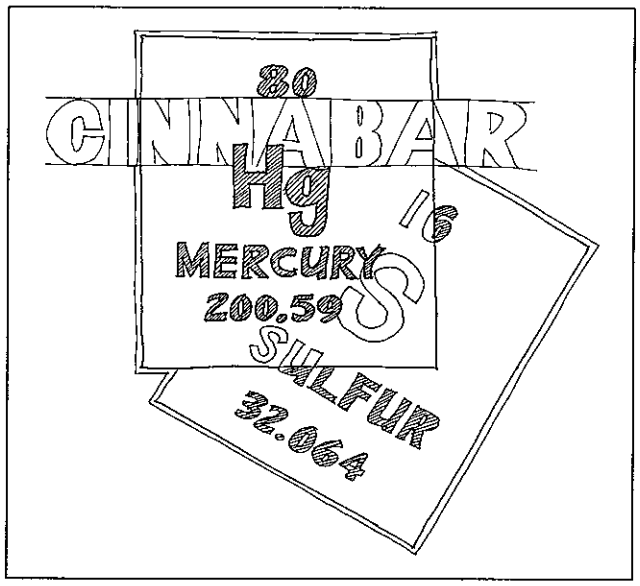
Conflicts with Other Plans and Policies

None have been identified.

Minerals and Energy

Direct Effects

Restrictions on access and the timing of operations are applied to mineral and energy exploration and development to ensure protection of other resources. The extent of these restrictions varies by alternative. Table 2-8, Chapter 2 (Minerals and Energy) displays access restriction as percent of the Forest and Grassland withdrawn, highly restricted, moderately restricted or with few restrictions. Alternative C-Modified restricts access the most, while Alternatives NC, A, and E-Departure restrict it the least.



Alternatives B-Modified and I are similar in that there is a moderate level of access restriction; the differences lie mainly in the low to moderate categories.

Indirect Effects

Mineral and energy development can have significant impacts on other resources. At the present level of activity on the Forest and Grassland, these effects are minor. However, if activity increases in the future, these effects could become significant. Because Alternative C-Modified restricts access the most, the indirect effects discussed below would be least under this alternative. Conversely, the significance of these effects would be greater under Alternatives NC, A and E-Departure.

Because mining removes land from production, it could result in a reduction in biological diversity, soil productivity, forage, timber, and wildlife habitat. Grass is often planted to rehabilitate mines and oil well sites, which could mitigate the effects of forage available to livestock and wildlife.

The remnants of early mining activities at the Mayflower, Amity, Blue Ridge and Independent mines represent historic sites which may meet National Register eligibility criteria. Attempts to reestablish any of these mines could result in the destruction of historic sites.

Recreational opportunities are limited or lost in areas of active mineral and energy development. Mining could negatively impact the character of unroaded areas and wilderness areas (existing claims only). Open pit mines, tailings piles, mill sites and oil well and storage facilities all have negative visual impacts. The staking of mining claims for agates or thundereggs might preclude the free use of those areas by rockhounds.

Placer mining has a direct effect on water quality, because it increases turbidity. Placer mining also kills fish eggs by silting in gravel deposits. Similarly, erosion from tailings piles can increase sedimentation in streams. The leaching of chemicals used in mineral processing could also decrease water quality.

Noise generated by road building, blasting and heavy equipment use could disturb wildlife. Wildlife habitat may be lost to open pit mining, placer mining, or the construction of mills. Oil well drilling can create openings in timber, which may benefit or harm wildlife.

Cumulative Effects

At present levels of activity, the cumulative effects of mining on other resources is probably insignificant.

There is some potential for increased interest in mining of locatable minerals, particularly gold and mercury. A proposal for a major site would trigger an Environmental Impact Statement and Amendment to the Forest Plan. Increased activity from mining operations could have cumulative effects including those resulting from decreased water quality (and therefore reductions in fish production). About 86,400 acres on the Forest and 19,250 acres on the Grassland have "high potential" for mineral occurrence. In a "worst case" situation, all of these acres could be placed under mining production, causing a cumulative affect on major resources on the Forest including timber, forage, wildlife, visuals, and water quality.

Mitigation Measures

The effects of mineral and energy development on other resources is mitigated through the use of operating plans and permits The plans and permits contain site-specific restrictions and rehabilitation requirements to minimize and mitigate adverse environmental impacts. A proposal for a major mining operation on the Forest or Grassland would require an Environmental Impact Statement and/or Forest Plan amendment.

Wilderness areas are withdrawn from mineral entry and energy leasing. No new mining claims may be established, and no energy leases may be issued in these areas. In addition, some facilities, developed recreation areas and a strip of road along Highway 26 have been withdrawn from mineral entry. A detailed discussion of these withdrawals may be found in FEIS Chapter 3.

Restrictions on oil and gas leasing to protect other resources are listed in Appendix D, Standards and Guidelines. As appropriate, leases may be issued with "no surface occupancy" stipulations, seasonal use stipulations, stipulations requiring drilling and storage facilities be set back a specified distance from an area or feature, or stipulations requiring that facilities be located out of view or camouflaged.

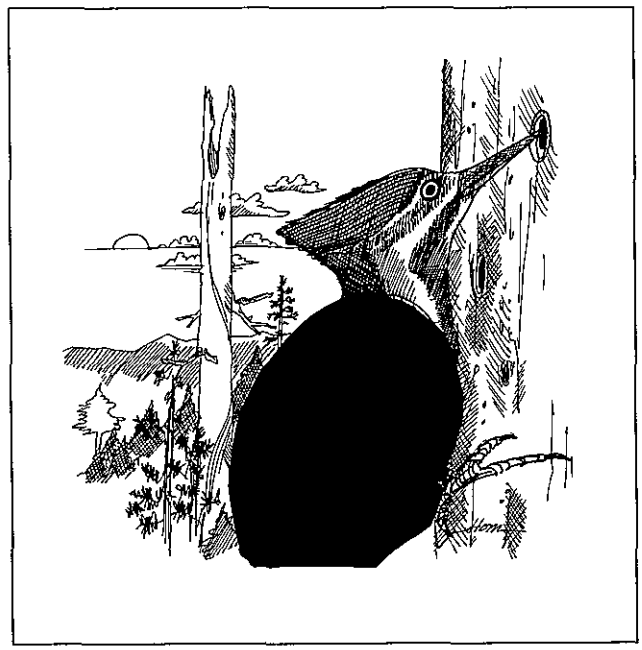
Mining claimants must have an approved operating plan before beginning any surface-disturbing operation. Operating plans in some areas, such as eagle roosting sites, will include a stipulation prohibiting activity from December 1 to May 1. In other management areas, measures will be included to ensure that operations meet management emphasis as much as is reasonable and economically possible.

All operating plans include a rehabilitation plan, and claimants are bonded to ensure that reclamation work is performed.

Conflicts with Other Plans and Policies

None have been identified.

Old Growth



Direct Effects

Issues over old growth are very complex and exist on a local, regional and national level. The reader is encouraged to review other chapters of this document before proceeding with the environmental consequences on old growth discussed here, in order to get a better picture of the existing condition (Chapter 3) and alternative proposals for management of old growth (Chapter 2). Some of the information from these chapters has been repeated here, but is limited to that needed to understand the effects.

As of December 1988, there were approximately 93.8 thousand acres of old growth (meeting the Regional Guide definition) on the Ochoco National Forest. An additional 50 thousand acres of "juniper old growth" (not meeting the Regional Guide definition) also exist, primarily on the Crooked River National Grassland. Total acres of inventoried old growth (93.8 thousand acres) will decline with every alternative as a direct result of timber harvesting. The rate of decline does not vary appreciably by alternative, but the difference in amount remaining at the end of the first, third and fifth decades varies

by almost 100 percent. Alternative No Change maintains the least amount at the end of 5 decades (about 40 thousand acres); Alternative C-Modified maintains the most (about 78.2 thousand acres). Table 4-13 displays how different alternatives treat the existing old growth over time, by major species groups (ponderosa pine and mixed conifer).

There are approximately 574 thousand commercial, forested acres on the Ochoco National Forest. Table 4-14 displays the percentage of these lands that will be remaining in old growth at the end of the five decade planning horizon. There are no estimates of the percentage of these total forested acres that were in old growth condition prior to the establishment of the Ochoco National Forest (1908).

TABLE 4-13
OLD GROWTH

		ALTERNATIVE					
Resource/Activity/Effect	Units of Measure	NC	B-MOD	E DEP	I Preferred	A	C MOD
Old Growth in roadless management areas with no programed harvest (F5, F8, F10, F11, D4, G5)	M Acres						
Ponderosa Pine			1 1	N/A	4 1	N/A	5 4
Mixed Conifer			2 0	N/A	12 5	N/A	12 9
Juniper			0 5	0 5	0 5	0 5	0 5
Total			3 6	N/A	17 1	N/A	18 8
Existing Old Growth areas in areas programmed for harvest (F7, F9, F11B, F12, F13, F14, F15, F16, F17, F18, F19, F20, F21, F22, F23, F24, F25, F26, F27, F28)	M Acres						
Ponderosa Pine			12 8	N/A	9 8	N/A	1 5
Mixed conifer			39 6	N/A	28 8	N/A	14 5
Total			52 4	N/A	38 6	N/A	16 0
Total Existing Old Growth	M Acres						
Pondersoa Pine							
Decade 1		23 2	23 2	23 2	23 2	23 2	23 2
2		18 0	16 2	18 5	18 2	20 0	19 2
5		5 0	9 2	13 0	13 0	12 0	19 0
Mixed Conifer							
Decade 1		70 6	70 6	70 6	70 6	70 6	70 6
2		62 0	64 4	64 0	65 7	53 0	66 6
5		35 0	33 2	42 0	42 1	41 0	59 2
Total Existing Old Growth Forest	M Acres						
Decade 5		40 0	42 4	55 0	55 1	53 0	78 2
Total Existing and Capable Old Growth							
Decade 1	M Acres	93 8	93 8	93 8	95 1	93 8	99 1

TABLE 4-14
FORESTED ACRES REMAINING IN OLD GROWTH

	Alternative					
	NC	B MOD	E-DEP	I Preferred	A	C MOD
% of Forested Acres Remaining in Old Growth (after 5 decades) 1/	6 5	7 9	10 3	10 3	9 9	14 6

1/ Includes only old growth meeting the Regional Guide difinition, does not include "old growth juniper" on the Crooked River National Grassland

Indirect Effects

Wildlife Habitat

Indirectly, reductions in old growth will result in declining habitat for old growth dependent wildlife species and therefore may reduce the breeding viability needed to maintain current populations. Pileated woodpeckers (management indicator species) require both reproductive habitats (old growth) and secondary feeding areas (high snag levels) of equal acreage in close proximity to each other (*A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region,* USDA Forest Service, June 1986). These combined habitat conditions are needed at no less than one per 12 to 13 thousand acres in order to maintain a viable breeding population. Secondary feeding areas may be of little value to dependent species, if the reproductive habitat is not available. On the contrary, reproductive habitat (old growth) should always contain characteristics of secondary feeding areas, in order to be classified as old growth.

Alternative No Change does not include provisions for secondary feeding areas, as Management Requirements have not been applied to it. In addition, only about 1/3 of the acres of old growth allocated in this alternative (32,860 acres) would actually be in a suitable condition at one time, because allocations are based on a managed, long rotation condition. Even though 26,500 of suitable habitat are provided in wilderness, roadless areas and research natural areas, they tend to be concentrated and isolated from other habitat areas. Alternative No Change has a high risk of indirectly affecting populations of pileated woodpeckers on the Ochoco National Forest because of poor overall distribution, and because total acres outside wilderness, roadless areas and RNA's are insufficient to maintain viable breeding populations.

Alternative B-Modified is designed to provide this habitat at the minimum level (see Management Requirements, Appendix F), established at 18,000 acres of reproductive and 18,000 acres of feeding areas across the Forest (outside of wilderness, roadless areas, and RNA's). (Minimum levels are designed to provide some level of insurance against natural catastrophe and should not, therefore, be considered a "threshold" below which the population would suffer irreparable damage.) As in Alternative I, revised minimum direction for flexibility in distribution was applied, so that the "best" available old growth within any 12 to 13 thousand acre area was selected, in lieu of a rigid distribution pattern which was maintained for Alternatives E-Departure, A and I. In addition, about 23,600 acres of suitable old growth are provided in wilderness, roadless areas and RNA's, but this tends to be concentrated and isolated. This alternative provides adequate long-term protection for maintaining species viability of old growth dependent species, but provides few additional options if habitat areas are destroyed by local catastrophe.

Alternative I (Preferred) was designed so that old growth was provided at the minimum level, but as in Alternative B-Modified, the "best" available old growth stand was selected within the minimum geographical area (12 to 13 thousand acres), in lieu of rigid distribution requirements. In addition, selected stands were maintained at higher acreages than required (300 acres), so that continuity of unique stands could be maintained. Also, specific mitigation measures designed to enhance movement between old growth blocks were designed into this alternative (see Mitigation Measures). In total, this alternative allocates 19,250 acres of old growth and an equal acreage of supplemental feeding areas, which is 1,250 acres above the minimum requirement. There is an additional 30,300 acres of old growth provided in unroaded, wilderness and Research Natural Areas, but again, these areas tend to be somewhat isolated. Even though optional habitat areas are not provided in this alternative as insurance against catastrophic events, additional mitigation measures and 1,250 additional allocated acres (equivalent to four reproductive old growth areas) above the minimum requirements are included.

The remaining alternatives (E-Departure, A, and C-Modified) all contain sufficient levels of old growth allocations (reproductive plus feeding areas), and exhibit a low risk of affecting viable populations of dependent species.

Biological Diversity

As an important element of biological diversity, old growth will be represented at different levels across the Forest over time. Table 4-15 displays acres of forested land by different successional stages for decades 1, 2 and 5 of the planning period (Stage VI representing old growth conditions). Alternative B-Modified (and probably No Change) results in the least acres of Stage VI at the fifth decade; Alternative C-Modified provides the most. The remaining alternatives (E-Departure, I and A) are all similar in terms of total acres remaining.

As discussed under Indirect Effects on Wildlife Habitat, the distribution of old growth (Stage VI) will also vary by alternative, with much of the old growth concentrated in wilderness, unroaded and research natural areas. None of the alternatives provide for an even distribution of acres and distance across the Forest over time.

Scenic Resources

Declining old growth does not necessarily equate to a decline in scenic resources on the Ochoco National Forest. Many open, parklike stands of ponderosa pine exist in current visual corridors, but have not been inventoried as "old growth" because official definitions (of old growth) preclude these particular stand conditions, even though tree ages in these stands average three hundred years and older (in many cases). Prime examples of these stand types occur in the Highway 26 Visual Corridor, but are not indicated in current (1988) old growth inventories (see Existing Old Growth Map - map packet). The alternatives provide various levels of land allocations to scenic resources (see Effects on Scenic Resources, this chapter). Management prescriptions for "retention" and "partial retention" call for long rotation stand management (200 to 300 years) to simulate old growth character as a visual resource, independent of official definitions. Additionally, "unique areas" are provided for with similar retention and partial retention objectives with the different alternatives. Direct comparisons of "big trees" for scenic resources, versus "old growth" are not possible, as the management objectives (and definitions) are substantially different.

Cumulative Effects

The cumulative effects of old growth habitat on the pileated woodpecker (management indicator species) were analyzed within an affected area which includes four National Forests in eastern Oregon (Ochoco, Wallowa Whitman, Malheur and Umatilla). Results of the analysis are summarized in Ochoco National Forest Memo, 1920 Land and Resource Management Planning - Wildlife Standards and Guidelines, April 23, 1982. A minimum legal requirement for maintenance of a viable population for this affected area was established at 500 birds (250 pairs). This number was derived from a formula found in Conservation Biology, Souli and Wilcox. Based on: 1) a 60 percent occupancy rate (derived from population ecology of pileated woodpeckers and consultation with Dr. Jack Ward Thomas); 2) a maximum five mile spacing requirement, and 3) acres of potential old growth available on each Forest, numbers of birds (pairs) and old growth acres were assigned on the basis of maintaining a genetically viable population as shown in Table 4-16.

It was affirmed at that time that all respective Forests would provide old growth habitat at minimum levels or higher.

In response to direction from Deputy Assistant Secretary of Agriculture Douglas MacCleery in March 1985, minimum requirements for wildlife in Region 6 were completely reassessed. The results are contained in "A Report on Minimum Management Requirements for Forest Planning on the National Forests of the Pacific Northwest Region," USDA, Forest Service, June 1986, on file at the Ochoco National Forest. During this assessment, an analysis of risk of population viability was developed for major indicator species in Region 6. It was determined that the pileated woodpecker was not at high risk currently, even though it may be at risk in the future (15-50 years). Management direction was subsequently changed to provide for greater flexibility in application of habitat management, especially concerning distribution of habitat areas. Alternatives B-Modified and I have been updated to reflect the increased flexibility in mitigation measures (see Mitigation Measures, below and in Appendix F).

TABLE 4-15
Acres of Forested Land By Successional Stage

		ALTERNATIVES					
Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Acres of Forested Land by Successional Stage							
Stage I and II (Grass forb/Shrub-seedling)	M Acres						
Decade 1		Unknown	9	9	9	9	9
2		Unknown	55	40	30	37	19
5		Unknown	45	41	34	43	21
Stage III (Pole sapling)	M Acres						
Decade 1		Unknown	146	172	151	170	138
2		Unknown	140	181	151	176	147
5		Unknown	69	88	83	106	42
Stage IV (Young)	M Acres						
Decade 1		Unknown	205	159	184	159	191
2		Unknown	167	127	192	123	158
5		Unknown	192	205	190	178	166
Stage V ((Mature)	M Acres						
Decade 1		Unknown	118	138	134	139	140
2		Unknown	129	142	115	151	162
5		Unknown	224	183	230	191	265
Stage VI (Old Growth)	M Acres						
Decade 1		Unknown	94	94	94	94	94
2		Unknown	81	82	84	84	86
5		Unknown	42	55	55	53	78

TABLE 4-16
Assignments Based on Maintaining Genetically Viable Populations of Pileated Woodpeckers

	FOREST				
	Ochoco	Wallowa-Whitman	Malheur	Umatilla	Total
Number of Pairs of Pileateds	40	75	70	65	250
Acres of Old Growth (M Acres)	20 1	37 5	35 1	32 4	125 1

Alternative No Change provides for about 32,860 acres of "well distributed" old growth habitat, in addition to about 26,500 acres concentrated in wilderness, roadless areas and RNA's. But the 32,860 acre allocation was based on a managed stand condition, so in actuality, only about 1/3 of the allocated acres (approximately 10,950 acres) would actually be in a suitable habitat condition at any one time. As this equates to only about 60 percent of the total acreage needed to maintain minimum species viability, Alternative No Change has a relatively high risk of reducing species viability of pileated woodpeckers on the Ochoco National Forest, and therefore may have a cumulative effect on the population within the affected area. Distribution of habitat areas does not allow for movement of birds, and therefore reduces reproductive capacity and needed exchange of genetic material. The significance of this effect would greatly depend on habitat allocations of other Forests in the affected area, since the Ochoco's contribution to the total population requirements is only about 16 percent of the total needed for species viability. This holds true for all of the alternatives considered.

The remaining alternatives (B-Modified, E-Departure, I, A and C-Modified) provide old growth at levels that equal or exceed minimum acreages needed for maintenance of species viability. Also, as stated previously, minimum requirements were designed to provide some level of insurance against natural catastrophe, and do not represent a critical threshold for species survival. There is an unlikely probability that any of these alternatives would have a significant cumulative effect on the population of pileated woodpeckers within the affected area.

Mitigation Measures

Management requirements for old growth dependent wildlife species habitat are designed to provide some level of insurance against catastrophic event. Some specific components of the requirement (i.e. minimum defense territory, snag requirements) are based on well documented research data (Bull and Meslow, 1977), (Bull, 1975). Other components, such as dispersal distance requirements, are based on professional judgement (Philips and Robers, 1985).

As these management requirements are in fact designed to reduce the risk that land management activities may have on species viability, they in fact serve as mitigation measures for the proposed alternatives, with the exception of Alternative NC, which includes no policy mandated requirements as such. See Appendix F, Management Requirements, old growth dependent species.

An additional mitigation measure was applied specifically to Alternative I (preferred), primarily to reduce the risk associated with allocating old growth at relatively low levels across the Forest. Approximately 1,000 acres of riparian areas on 41 miles of primary Forest streams were identified as "connective habitat" during the land allocation process. The protected area on these streams was expanded from 100 to 200 feet on each side, in order to provide additional security for wildlife while travelling from original or primary habitat areas. According to Bull, 1988, "pileated woodpeckers dispersing to new territories are likely to use these travel lanes if surrounding areas are not forested."

It is not known whether old growth can be simulated over time through manipulation of stands. Specific characteristics, such as size and number of trees per acre, can be replicated with reasonable assurance, but proper size and distribution of both live and dead trees in the stand may not be achievable, given current knowledge and management practices. Based on historical perspective though, it is believed that future management will be at least partially successful in providing old growth from stands previously harvested.

Conflicts with Other Plans and Policies

None have been identified at this time.

Recreation

Direct Effects

Although some recreational activities such as camping can occur in any setting, many people choose different recreational settings for different recreation experiences. The Recreation Opportunity Spectrum (ROS) describes the different settings in terms of the recreation experiences they can offer (see Chapter 3 Affected Environment for a detailed discussion of ROS).

Vegetative manipulation, timber harvest, road construction, and access management are major activities that affect recreation settings. For example, roading and timber harvest increases access for motorized travel and firewood gathering, but at the same time affects the "naturalness" of an area and discourages those seeking a nonmotorized experience in a natural environment. The changes in recreational settings vary by alternative according to different levels of harvest and road construction within unroaded areas. Specific recreational activities (such as hunting and fishing) may be important components of different ROS settings; the effects on these are also discussed when appropriate.

Primitive Setting

There are no areas managed for primitive recreation opportunities, outside of designated wilderness areas, for any of the alternatives (see Effects on Wilderness, this chapter).

Semiprimitive, Nonmotorized Setting

Semiprimitive, nonmotorized recreation opportunities are directly dependent upon areas being maintained as unroaded and managed without use of motorized vehicles. Development of nonmotorized trails can increase use within a particular area, but the major limitation on supply occurs through the management allocation process.

Road building, timber harvest, and other vegetative manipulation eliminates the setting for semiprimitive nonmotorized recreation. Each alternative affects this setting to a different degree, based on acres allocated to unroaded conditions. Table 2-8, Chapter 2, Alternatives Considered displays acres remaining unroaded, plus projected RVD (Recreation Visitor Day) supply and demand over time. Table 4-17 displays a summary of RVD supply and demand projections for the various alternatives over the five decade planning period.

Alternative B-Modified reduces the semiprimitive, nonmotorized setting more than the other alternatives; it calls for road construction and timber harvest at a rapid rate, reducing the total unroaded acres to approximately 16 thousand acres by the end of the first decade. Only portions of Lookout Mountain, Deschutes Canyon/Steelhead Falls, and Silver Creek unroaded areas remain in a semiprimitive, nonmotorized condition. Only about one third of the demand for this setting can be provided in the first decade, despite trail development into these areas.

In Alternatives A and No Change, the area available for the semiprimitive, nonmotorized setting is reduced to approximately 29 thousand acres by the end of the first decade due to road construction and timber harvest. Lookout Mountain, Deschutes Canyon/Steelhead Falls, and Silver Creek would remain semiprimitive, nonmotorized throughout the planning horizon (5 decades). Projected demand for recreation opportunities in this setting cannot be met in the first decade with these alternatives. Lack of trail development into these areas in these alternatives restricts use to less than one half of the available area.

TABLE 4-17
Summary of RVD Supply and Demand Projections

	ALTERNATIVES					
	NO CHANGE	B MOD	E-DEP	I Preferred	A	C-MOD
SPNM RVD'S Supplied	11 1	11 4	35 2	47 2	11 1	55 4
SPNM RVD'S Demand - Decade 1	34 2	34 2	34 2	34 2	34 2	34 2
2	37 4	37 4	37 4	37 4	37 4	37 4
5	48 1	48 1	48 1	48 1	48 1	48 1

SPNM - Semiprimitive, Nonmotorized
RVD'S - Recreation Visitor Days

Alternative I (Preferred) maintains enough unroaded area to provide for the projected demand for this setting through the fourth decade by completing trail systems into all parts of the remaining areas. Projections of supply and demand are nearly equal by the fifth decade (demand exceeds supply by only .9 thousand RVD's; about two percent). Lookout Mountain, portions of Rock Creek/Cottonwood Creek and Deschutes Canyon/Steelhead Falls, and Silver Creek remain unroaded, providing a total of approximately thirty-six thousand acres of semiprimitive, nonmotorized setting. 1/

Alternative E-Departure reduces total acres of unroaded areas to about thirty-five thousand by the end of the first decade, but seven thousand acres (Green Mountain unroaded area) are proposed for motorized recreation. Prescriptions for motorized recreation in this area (Green Mountain) do not eliminate options for future nonmotorized opportunities, but in the short term will conflict with the setting required for this use (semiprimitive, nonmotorized). Demand for the semiprimitive, nonmotorized setting is projected to surpass available supply by the second decade, in part due to the lack of trail development into remaining unroaded areas. By the fifth decade, projected demand exceeds supply by about 13 thousand RVD's (37 percent).

Alternative C-Modified provides semiprimitive, nonmotorized opportunities in excess of projected demand through the full planning period (5 decades). Approximately 57 thousand acres remain unroaded, but as in Alternative E-Departure, Green Mountain unroaded area is managed for motorized recreation, maintaining options for future nonmotorized opportunities. A net area of about 49 thousand acres is provided for semiprimitive, nonmotorized recreation with this alternative; this represents the maximum provided from any of the alternatives.

Semiprimitive, Motorized Setting

Semiprimitive motorized recreation opportunities are also dependent (as are semiprimitive nonmotorized) on maintaining unroaded areas on the Forest and Grassland. Even though some of the current unroaded areas (such as Rock Creek/Cottonwood Creek) are limited in terms of access and terrain for motorized use, development of improvements such as roads and trails could increase the availability for this setting. It is assumed (due to insufficient data) that only one unroaded area (Green Mountain) is suitable for a semiprimitive, motorized opportunity.

FOOTNOTE 1/Some development of Lookout Mountain for recreational purposes is planned, but is designed to maintain semiprimitive, nonmotorized characteristics

Alternative E-Departure and C-Modified manage the Green Mountain unroaded area for semiprimitive, motorized opportunities throughout the planning horizon (5 decades). Table 2-8 (Chapter 2 shows that projected demand for this setting will increase dramatically, exceeding this supply by 11 thousand RVD's (260 percent) in the first decade and 18.1 thousand RVD's (360 percent) in the fifth decade.

The remaining alternatives (No Change, B-Modified, I, AND A) eliminate semiprimitive, motorized opportunities entirely. The demand for this setting is projected to increase to 18 thousand RVD's by the first decade and to 25.1 thousand RVD's by the fifth decade.

Roaded Recreation Setting

The roaded recreation setting is important to the majority of the Forest visitors. Access and natural-appearing surroundings combine to provide an ample supply of this opportunity with all of the alternatives (see Table 2-8, Chapter 2, for data on roaded recreation). Alternative C-Modified provides the least amount of this setting over time, but still exceeds demand by 605 thousand RVD's (215 percent) in the fifth decade. Alternative No Change provides the greatest opportunity for roaded recreation; supply exceeds demand by about 960 thousand RVD's (285 percent) in the fifth decade. The remaining alternatives (B-Modified, E-Departure, I, AND A) all provide more than sufficient roaded recreational opportunities throughout the planning horizon (5 decades).

Quality of the Roaded Recreation Setting

The roaded recreational setting is a broad category that encompasses a wide variety of opportunities for the Forest user. Scenic resources may range from heavily altered (Maximum Modification) to unaltered (Preservation), and access can vary from highly restricted (or even prohibited) to minimally restricted. Even though all of the alternatives are similar by providing a surplus of roaded recreational opportunities, they vary greatly by the quality of opportunities within this setting (see Effects on Scenic Resources and Effects on Transportation System, this chapter). In summary, the alternatives can be ranked according to the qualitative effect that they have on the roaded recreational setting as shown in Table 4-18.

TABLE 4-18
Qualitative Effect On Roaded Recreation

	ALTERNATIVE	
	Scenic Quality	Restricted Access
Least Negative Effect	C-MOD I B-MOD E-DEP	A and NC E-DEP B-MOD I
Most Negative Effect	A and NC	C-MOD

Other important factors may affect the quality of the roaded recreation experience. Recreationists can expect to encounter difficult and dusty travel, and possibly safety problems during periods of heavy log hauling. Sights of recently logged areas, including stumps, slash, cull logs, fresh skid trails and landings will be encountered, especially during late spring, summer and fall These effects are common to all alternatives, but may vary significantly as a result of planned timber harvest levels. It is reasonable to assume that the risk associated with these effects can be directly associated with timber outputs as shown in Table 4-19.

TABLE 4-19

	ALTERNATIVE
Higher Risk of Encounter	NC B-MOD E-DEP A I
Lower Risk of Encounter	C-MOD

Trail System

Trail systems oriented to recreational uses are most desirable when traversing terrain that is natural-appearing, offering a variety of landscapes and difficulty. Depending on intensity of timber harvest and road construction, the scenic character of the area and the actual trail routes can be changed or lost resulting in displaced use, trail closures, trail relocations or reconstruction. Each alternative reflects

different trail system proposals based on differences in unroaded areas being maintained and the differences in intensity of harvest outside of unroaded areas (see Table 2-8, Chapter 2, Alternatives Considered for planned trails by alternative).

Alternatives A and No Change include no addition to the trail system due to extensive even-aged management of timber stands. Maintenance of the existing routes would be difficult due to the harvest levels and the roading of unroaded areas for timber harvest.

Alternative E-Departure includes a moderate trail system based on the effects of increased use of even-aged harvest of pine stands. This demonstrates the need for concentrating the system in the unroaded areas and the main East-West Intertie and Summit Historic Route.

Alternative B-Modified includes more uneven-aged management of timber stands which offers more opportunities to develop and maintain trail systems. The harvest of Rock Creek/Cottonwood unroaded area and the lower portions of Lookout Mountain affect proposed and existing summer nonmotorized routes within these areas. Opportunities to develop motorized routes for summer travel, and snowmobile/cross-country ski routes for winter travel, may even be improved by allowing increased use of temporary roads and skid trails, and through extensive use of uneven-aged management.

Alternatives I and C-Modified include eventual construction of the total trail needs on the Forest and Grassland, most of this construction will occur in the first two decades. Primary unroaded areas, as well as unique recreational areas (such as Hammer Creek Area), are maintained in natural or near natural conditions and uneven-aged management of timber stands on the Forest is extensive, thus providing the necessary settings to justify additions to the trail system. As in Alternative B-Modified, opportunities to develop motorized routes for summer travel and snowmobile/cross-country ski routes for winter travel may even be improved by allowing increased use of temporary roads and skid trails, and through extensive use of uneven-aged management.

Big Game Hunting

Hunting opportunities vary primarily with game populations, but can also depend on quality factors such as remoteness and the challenge associated with hunting of unique animals that prefer habitat in wild and secluded areas provided by the Forest's unroaded and wilderness areas (e.g. multi-tined Rocky mountain elk). Populations of primary game animals on the Forest (elk and deer) react somewhat predictably to changes in habitat provided on the Forest and Grassland (see Appendix B, Section 6).

Overall populations of mule deer are expected to remain constant over the next five decades for all alternatives except B-Modified and No Change. This population is estimated at about 22,600 animals. For Alternative B-Modified, the population is predicted to remain constant for two to three decades, but then decline to about 17,200 animals by the fifth decade. This will also reduce a major hunting opportunity on the Forest, which is also assumed to be the number one recreation activity in terms of visitors days used. Alternative No Change is similar to A, but data is not available to make reasonable predictions on deer numbers. No significant negative effects are predicted for Alternative No Change; effects would probably be no worse than Alternative B-Modified.

Rocky mountain elk populations are estimated at 2,300 on the Forest today. As elk appear to be more sensitive than mule deer to changes in habitat, the populations vary more widely with the various alternatives. All alternatives except NC are predicted to increase populations of elk on the Forest over the first decade. As with mule deer, there is insufficient data to predict changes in elk populations with Alternative NC, but populations will probably be similar to Alternative A. In the long term (decades 2-5) populations of elk will begin to decline for all alternatives except C-Modified, but projections indicate that even with this decline, fifth decade populations will still be higher than today's numbers, except for Alternative B-Modified, which results in a rather dramatic decrease to 1700 elk by the fifth decade.

Pronghorn populations are estimated at about 590 animals on the Forest and between 70 and 160 animals on the Grassland. Hunting of pronghorn is not considered significant as compared to deer and elk, mainly due to the limited population. Opportunities for increasing populations are currently limited; the existing suitable habitat appears to be fully occupied, at least on the Forest. Management of pronghorn on the Grassland is an issue related to conflicts with livestock management and motorized recreation, Alternative I, B-Modified and C-Modified allocate areas for pronghorn management emphasis in order to resolve these issues, but significant increases in hunting visitor days are not predicted, despite this.

Recreation visitor days associated with hunting will tend to follow population trends of mule deer and elk over the planning period (see Table 2-8 Hunting Use-WFUD's, Chapter 2). Alternative C-Modified will probably produce the largest increase in hunting use over the long run, even though other alternatives (B-Modified, E-Departure, and A) show a larger increase in the short run, primarily due to more rapid changes in habitat conditions.

Fishing

Fishing opportunities are directly related to stream condition and the ability to produce a quality fishery. Each alternative improves different levels of streams in excellent condition, reflecting levels of activities that degrade streams, irrigation and scheduled improvement projects (see Effects on Water, and Effects on Wildlife and Fish, this chapter). Common to all alternatives (except No Change) is excellent riparian condition for all anadromous fish habitat, resulting in substantial increases in anadromous fisheries over the planning period; habitat for resident fish varies with each alternative. Alternatives C-Modified, I, and B-Modified offer the greatest opportunity for overall fishing as projects are scheduled to bring all streams to excellent conditions. In Alternatives E-Departure and A, investment levels in riparian restoration are limited to high priority areas, resulting in lower projected outputs of resident fisheries. As with hunting, recreational use associated with fishing is directly related to outputs of fish and increases over existing conditions with all alternatives. In contrast to hunting use, fishing and associated recreational activities continue to increase throughout the planning period for all alternatives (see Fish and Recreation outputs, Table 2-8, Chapter 2).

Indirect Effects

Providing recreational opportunities through specific land allocations to semiprimitive motorized and nonmotorized settings produces an indirect but significant effect on other resource uses.

Some effects are more appropriately described as foregone "opportunity costs" rather than as specific actions, as management for these settings reduces or eliminates more commodity-oriented endeavors such as timber harvest, grazing, mineral exploration, and even other recreational pursuits associated with a roaded setting. Appendix C describes specific effects on other resource uses as a result of semiprimitive allocations for individual unroaded areas. Appendix B (Section 7) discusses resource tradeoffs for combined unroaded allocations.

Areas managed for semiprimitive opportunities provide quality hunting experiences not found throughout more intensively managed, roaded areas. These islands of unroaded, nonmanipulated vegetation offer seclusion and escape for many wildlife species, providing a challenge for those hunters wishing to use backcountry skills in pursuit of elusive and, many times, large trophy animals.

Forest health is much more difficult to maintain in areas allocated for semiprimitive opportunities. Opportunities for using silvicultural techniques are limited due to accessibility problems. Options are mainly limited to prescribed fire and aerial application of chemicals. Recurring infestations of spruce budworm are a serious problem on the Ochoco National Forest, and unroaded areas provide islands of habitat for this and other insects and diseases which have increased dramatically as a result of many decades of fire exclusion.

See Effects on Unroaded, this chapter, for more detailed information on indirect effects of unroaded allocations.

Motorized recreational use (ATV and ORV) causes damage to other resources when users fail to obey laws and regulations or when the Forest fails to properly manage it. Soil erosion can be excessive in steep areas, or in areas with low vegetative cover. Riparian areas tend to receive higher resource damage than other areas because of the high level of access within them. Standards and guidelines (see Appendix D) are designed to limit this damage to within acceptable levels, but public trust and respect for the land is a necessary component of the overall management scheme to manage motorized use for the benefit of the users and other resources. See Effects on Soil, Wildlife and Water, this chapter, for more detailed discussions of motorized recreation on other environmental components. Also see Mitigation Measures, this section, for methods to reduce effects of motorized recreation on other resources.

Recreational facilities such as campgrounds, dispersed campsites, trailheads, and trails impact soils and watersheds by taking land out of production for construction purposes and by compacting and displacing soils in areas of heavy traffic. Alternatives C-Modified and I have more effects on these resources than the other alternatives, due to a higher level of planned construction and reconstruction of recreational facilities, and as a result of high levels of scheduled trail construction (see Table 2-8, Chapter 2 for display of recreational developments planned over the planning period).

Cumulative Effects

As unroaded areas continue to be developed for purposes other than backcountry recreation, people searching for these experiences will find fewer and smaller areas offering this opportunity. As a result, wilderness and the remaining unroaded areas may receive increasing use and overcrowding. This produces unacceptable conditions and undesirable use levels for wilderness and unroaded area experiences. The encounters with others become too frequent to allow for the recreation experiences sought. Use of dispersed sites and increases in numbers of dispersed sites is expected to occur as people discover the Forest and Grassland and search for a non-crowded recreation experience. People now utilizing the Deschutes National Forest may move east to avoid the crowds and developments occurring in that area.

Mitigation Measures

The National Recreation Strategy, developed to encourage partnerships and maintain quality recreational opportunities, has been incorporated into Alternatives C-Modified, I and B-Modified. This emphasis on quality outdoor recreation includes the mitigation of other resource activities on recreational opportunities as well as mitigating the impacts of recreation on other resources.

Measures designed to mitigate the effects of various activities are identified in the Standards, Guidelines, and Prescriptions in Appendix D. Some of the major mitigation measures are listed below:

To maintain semiprimitive recreation opportunities, unroaded areas are designated as special management areas and vehicles are restricted to protect the unroaded qualities.

Scenic corridors are designated and corridor plans will be developed to maintain the naturalness along specific roads and trails.

Trails that cross timber sales are managed, maintained and protected during harvests by sale layout and contract preparation and administration. Trails may be relocated to reduce impacts by harvest.

Road systems are designed and maintained to accommodate different types and levels of recreation traffic.

Developed sites are protected from mineral entry through the withdrawal procedures. These sites are also maintained, managed and protected during timber harvest through clauses in the timber contract. Areas where soil compaction is unacceptable will be rehabilitated and/or rested.

Cross-country ski opportunities away from snowmobiles may occur through the issuing of a Forest closure order prohibiting snowmobiles in certain areas.

Traffic controls can be initiated to restrict log haul on weekends and holidays to facilitate recreation traffic.

Roads can be closed after log haul to further protect wildlife habitat resulting in more nonmotorized recreation (hunting) opportunities.

Rockhounding areas can be withdrawn from being individually claimed to keep them available for general public use.

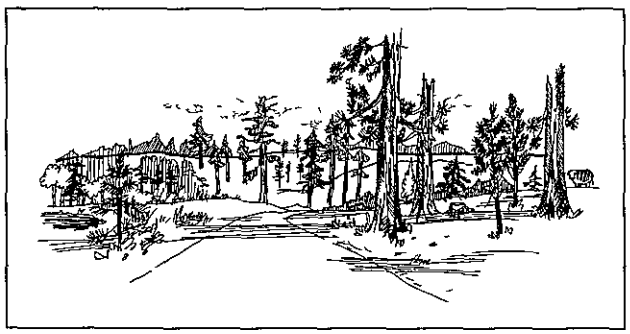
Timber sale areas can be left open for several seasons after harvest for people to gather firewood.

All vehicular use can be restricted on critical winter range during critical times by travel plan implementation.

Conflicts with Other Plans and Policies

None are known to exist.

Scenic Resources



Direct Effects

Effects on scenic quality are measured by the degree of change from the natural condition of an area. A landscape may appear natural or heavily altered depending on the extent of the management activities in the area. Timber harvest, vegetative manipulation projects, and road construction are the primary activities that affect the naturalness of an area.

Visual quality objectives (VQO) have been established for all Forest and Grassland areas based on the National Forest Visual Management System (VMS). The VMS process is briefly described in Chapter 3. These VQO's are describe as follows: Preservation, which allows no alteration of the landscape; Retention, which allows management activities that are not obvious to the casual observer; Partial Retention, which has management activities that are noticeable but do not dominate the landscape, and Modification/Maximum Modification where management activities are obvious and dominate the landscape. (The Forest's visual resource inventory and analysis of the alternatives combined the Modification and Maximum Modification areas.)

Scenic corridors called viewsheds have been identified in the land areas seen from major highways, trails, heavily used recreation sites, lakes and some streams. In the various alternatives, these viewsheds are treated differently based on the emphasis of the alternative. In alternatives E-Departure and B-Modified, where commodity production receives the highest emphasis,only the major viewsheds are managed to maintain their scenic qualities while the other viewsheds are managed for timber production. In alternative C-Modified, most of the inventoried viewsheds are managed to maintain the scenic quality as retention or partial retention corridors based on the recommended VQO.

In all of the alternatives, including the Current Direction alternative, the present naturalness of the Forest will continue to change toward a more heavily altered appearance. This will mean that in most of the Forest the large ponderosa pines will continue to disappear and the number of cleared openings and patches of young trees will increase. The Forest will look less natural.

The degree of this change varies between alternatives. Wilderness areas will be preserved in a natural condition. Areas maintained and managed for their unroaded condition, scenic river corridors and Research Natural Areas (RNA's) will present a natural appearing scene. Areas managed for intensive timber and forage production will present a modified or heavily altered scene. Access routes through or to these various areas may receive special treatment to protect or enhance the view, depending on the amount and sensitivity of the traffic.

Table 4-20 displays the acreage and the percent of area identified for each visual quality objective by alternative.

these viewsheds, management activities will not be evident to most people after about one year from the time the activity has been completed. Fore-

TABLE 4-20
Acreage and Percent of Area by Visual Quality Objective

	ALTERNATIVES					
Visual Objective	NC	B-MOD	E-DEP	I Preferred	A	C-MOD
Preservation 1/						
M Acres	38 3	39 5	43 3	42 0	38 3	50 9
Percent	4 0	4 1	4 5	4 4	4 0	5 3
Retention 2/						
M Acres	102 2	60 7	70 7	96 8	102 2	155 6
Percent	10 7	6 3	7 4	10 0	10 7	16 3
Partial Retention 3/						
M Acres	71 4	28 1	59 4	32 4	71 4	61 5
Percent	7 5	2 9	6 2	3 4	7 5	6 4
Modification/ Maximum Modification 4/						
M Acres	743 2	827 8	781 6	784 9	743 2	687 1
Percent	77 8	86 6	81 8	82 1	77 8	71 9

1/ Preservation includes Wilderness and Research Natural Areas
2/ Retention includes unroaded, old growth, developed recreation, enhanced riparian areas, and access corridors specifically managed for recreation VQO
3/ Partial Retention includes maintained riparian areas and access corridors managed for partial retention VQO
4/ Modification and Maximum Modification includes all other areas timber/range and areas for wildlife habitat improvement

Alternative A and Alternative No Change

In general, the Forest lands outside of viewsheds, wilderness, Research Natural Areas, and the three managed unroaded areas will appear to be moderately to heavily altered. Most of the trees will be smaller than 24 inches in diameter. A mosaic pattern of harvest openings and patches of young trees of varying sizes in blocks of between 20 and 40 acres will dominate the landscape. At least for the next decade, the light colors and fine textures of replanted younger trees will contrast with the darker colors and courser textures of yet uncut older tree blocks. The large, ponderosa pines which have been a dominant visual element in the Ochoco Forest landscape will disappear, to be replaced by young, thicker stands of trees. State Highway 26, the Round Mountain Trail, and Forest Roads 16, 17, 27, 33, 41, 42, 43, and 58, will continue to appear natural. In grounds seen from these roads and trails will maintain a big-tree character. Some other minor access roads will be managed for partial retention, which means that management activities such as timber harvest will be noticeable but will not dominate the view.

Alternative B-Modified

The general overview of the Forest landscape shows the majority of lands would be modified to some extent through timber harvest and road construction. A good portion of the pine stands would appear somewhat natural as uneven-age management is applied. These stands would preview 20-inch diameter trees and more entries into the areas would be evident. Management activities will alter the landscape and will be obvious to the casual observer throughout most of the Forest except along the

Highway 26 visual corridor, on 9,000 acres along a couple of major routes, Bandit Springs, the upper 7,550 acres of Lookout Mountain, Silver Creek, Stein's Pillar, Squaw Creek, Hammer Creek, the wilderness areas and the Wild and Scenic Rivers, management activities will not be obvious. The north slope mixed conifer stands will appear heavily altered as clearcut areas will stand out due to the average timber harvesting and road construction.

Alternative C-Modified

In general the appearance of the Forest will be similar to the current situation; all major roads will be managed to protect and enhance the natural landscape. Views along Forest Roads 16, 17, 22, 26, 27, 33, 38, 41, 42, 43, 47, and 58 should continue to appear natural. Approximately 40,000 acres of other secondary access viewsheds will offer a slightly altered landscape where management activities are evident but do not dominate the landscape. Large blocks of old growth and natural-appearing landscapes will be apparent in the wilderness areas, RNA's, and the 44,000 acres managed as unroaded. The 3,000-acre Bandit Springs cross-country ski area is managed to protect and enhance the natural old growth appearance of this landscape. The Forest area outside of the viewsheds and special management areas will appear moderate to heavily altered from timber harvests and projects to improve wildlife habitat. Seventy percent of the timbered area will be young tree stands.

Alternative E-Departure

In general, the Forest lands outside of the viewsheds, wilderness, RNA's, and the four managed unroaded areas will appear heavily altered in Alternative E-Departure. The large ponderosa pines which have been a dominant visual element in the landscape will be replaced by younger, thicker stands of trees. Eighty-eight percent of the timbered areas will be dominated by managed stands less than 100 years of age. State Highway 26 and the main route to Rager Ranger Station viewsheds will continue to appear natural. Management activities in these two viewsheds will not be evident to most people one year after the activity has been completed. The big-tree appearance will be maintained here also. Forest Roads 17, 22, 26, 27, 33, 41, 42, and 43 will be managed for partial retention, which means that management activities such as timber harvest will be noticeable, but will not dominate the view of the landscape. All other access routes will have no special visual management emphasis and management activities may dominate the scenery.

In addition to the viewsheds along these sensitive travel routes, the 3,000 acre Bandit Springs cross-country ski area and the special wide 7,000-acre scenic zone encompassing Crystal Creek, Walton Lake, Round Mountain, Lookout Mountain, Mt. Pisgah, and East Point will be managed to protect and enhance the old growth natural appearance. Most of the area remaining outside of these special management areas receives an intensive timber management emphasis which will dominate these landscapes.

Alternative I (Preferred)

The Forest and Grassland will offer natural-appearing scenery along all major travel routes in the Forest. Areas such as Steins Pillar, Hammer Creek, and Deep Creek will also maintain the scenic qualities associated with these areas. All of the Lookout Mountain unroaded area will provide unique natural scenery as will the major portion of Rock Creek/ Cottonwood Areas, Bandit Springs Area, Squaw Creek, Silver Creek and the Wild and Scenic River Corridors. Uneven-age management in the pine stands will provide a more natural-appearing landscape in the pine areas across the General Forest. These areas will feature a smaller tree (20-inch diameter) average and evidence of more frequent entry.

Indirect Effects

Maintaining scenic viewsheds affects the quality of recreation opportunities and experiences. People prefer a natural appearing scenic environment for recreation activities. Alternatives that maintain the majority of the viewsheds such as C-Modified and Alternative I will meet the expectations of more recreationist by providing quality to the areas most frequently visited. Alternatives E-Departure and B-Modified maintain fewer viewsheds in the natural appearing condition and will be less acceptable to the recreating public.

Maintaining scenic viewsheds affects the intensity, location and manner in which management activities can be completed. Alternatives that maintain the viewshed corridors such as Alternative C-Modified and Alternative I will be most restrictive on resource management activities in these areas. Timber harvests will be reduced in these areas as well road construction. Locations of units and roads is limited. Prescribed fires must be carefully planned and executed to reduce visual impacts in these viewsheds. Other activities such as mining, utility lines, oil and gas explorations, wildlife habitat projects will have limits and restrictions to maintain viewsheds.

Cumulative Effects

The effects of natural and resource management activities on landscapes constantly change the scenic qualities of that landscape. As management activities become more evident, the naturalness of a particular area will be lost, and recreational opportunities will be less desirable, depending on the user's objectives. The alternatives can be ranked according to the degree of negative change to the landscape and therefore the cumulative naturalness of the Forest.

Mitigation Measures

Landscapes can continue to appear natural by alteration of management activities to blend them into the landscape as designed in the visual retention prescription. Clearcut units can be positioned so they blend into the landscape. Roads can be designed to limit their visual effect on the landscape Activities can be scheduled during periods of low public use, or when damage can be prevented, such as skidding over snow.

TABLE 4-21
Cumulative Effect on Scenery
(and Recreation Opportunities)

	ALTERNATIVE
Least Amount of Effect	C-MOD NC & A I E-DEP
Highest Amount of Effect	B-MOD

Intensities of management activities can be reduced so they are evident but do not dominate the landscape.

Unattractive views can be softened by feathering the effects, maintaining corridors between, planting vegetation and transplanting larger trees to screen the area.

Viewshed management plans can be developed and implemented that will protect, enhance and/or perpetuate the scenic values of the area.

Uneven-aged timber management can be implemented to retain a relatively unbroken canopy and diversity in sizes of trees in an area.

Harvest unit size can be reduced to lessen the visual impact to an area. Residue from timber harvests can be eliminated through various slash disposal techniques and fuelwood gathering.

Many other design techniques can be utilized to mitigate visual impacts of management activities. These are described in the National Forest Landscape Management Series (USDA Vol. 2, Chapter 6, 1973-1985).

Conflicts with Other Plans and Policies

None are known to exist.

Social and Economic

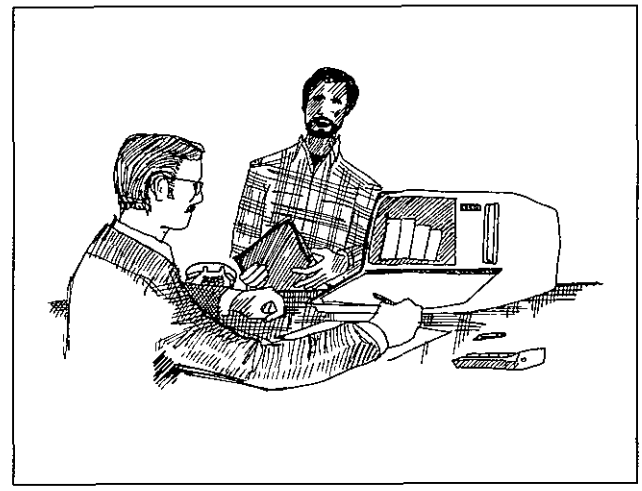


TABLE 4-22
Changes in Employment for Various Economic Sectors by Alternative
(# of Jobs - First Decade)

	ALTERNATIVES				
Economic Sector	B-MOD	E-DEP	I Preferred	A	C-MOD
Logging	14	10	5	5	-7
Sawmills	25	18	10	9	-14
Remanufacturing	35	30	8	3	-55
Range-fed Livestock	1	1	1	1	0
Retail Trade Produced by Wood Products Industries and 25% Monies	31	16	6	3	-22
Produced by Recreation	21	49	45	18	51
Other Sectors	64	73	43	19	-53
Total All Sectors	176	196	118	57	-101

TABLE 4-23
Forest Budget by Alternative
(Millions of Dollars - First Decade)

	ALTERNATIVES					
	NC	B MOD	E-DEP	I Preferred	A	C-MOD
Salary	Unknown	54	53	52	52	51
Supplies, etc	Unknown	27	26	26	26	25
Contracting	Unknown	40	26	24	31	19
Total	120	121	105	102	109	95

Direct Effects

The direct effects of the alternatives include the following:

Employment levels produced by the alternative's mix of outputs.

The amount of the Forest budget.

The amount of 25 percent monies paid to the counties.

It can be seen that expenditures for salaries and for supplies vary less than contracting expenses. Alternative B-Modified provides the most support for local economies, and Alternative C-Modified the least.

The 25 percent monies distributed to the counties are shown in Table 4-24.

Alternative E-Departure provides the most support to the counties in the first decade; Alternative C-Modified provides the least.

TABLE 4-24
25% Monies Distributed to the Counties
(First Decade - Millions of Dollars)

NC	B-MOD	E-DEP	I	A	C-MOD
49	49	51	49	43	35

Indirect Effects

The previously mentioned economic effects of the various alternatives would produce effects on the social fabric of the area. These social effects will be measured by four criteria, as follows.

Effects on work-related lifestyle.

Effects on leisure activities.

Effects on community cohesion and community stability.

Effects on women and minorities.

Effects on Work-Related Lifestyle

Six lifestyles were identified in the Socio-Economic Overview prepared for the Forest and Grassland (pp. 62-92). They are: Native Americans, farmers, loggers, millworkers, small town merchants, and government employees. These lifestyles are related to occupations, but are not limited to them.

In terms of county totals, the numbers and incomes of farmers and of government employees do not vary significantly by alternative. The Native American lifestyle is discussed in the "Women and Minorities" section. Employment levels for loggers, millworkers, and small town merchants will be discussed here.

For loggers, Alternative B-Modified would increase employment by 14 jobs, which is around four percent of total logging employment. This change is considered to be barely significant. Alternatives E-Departure, I, and A would increase employment for these sectors by one percent to three percent, while Alternative C-Modified would decrease employment by two percent. As discussed in the Cumulative Effects section, these changes and all employment changes may be affected by other factors.

For millworkers, the changes range from a three percent employment gain (Alternative B-Modified) to a three percent loss (Alternative C-Modified). None of these changes is considered to be significant. However, the remanufacturing industry will be affected by the Forest Plans of several Forests. This matter is discussed in the Cumulative Effects section.

Merchants benefit from any alternative. Their gain, as expressed in an increased number of employees, ranges from one percent (Alternative A) to four percent (Alternative E-Departure). Small town merchants, however, hire a smaller proportion of employees than do other businesses. Therefore, we consider that the merchants benefit more than these figures indicate.

Effects on Leisure Activities

Recreational activities are important to many central Oregonians. Some people have moved to central Oregon because of the recreation available here.

Alternative C-Modified would provide for the most recreation activities. Elk and fish are at the highest levels of any of the alternatives, as are opportunities for unroaded recreation. Landscapes appear most natural to the driver or hiker. Fuelwood gathering is the one activity which is at its lowest

At the other end of the scale, Alternative A provides, in general, the least recreational opportunities. Unroaded areas and fish are at the lowest levels. Unlike the other alternatives, there is no construction of trails for hiking, ATV's, cross-country skiing, or snowmobiling.

Generally speaking, Alternative B-Modified provides the next lowest level of recreational opportunities. Unroaded areas and elk are at low levels. The scenery is the lowest of all the alternatives. However, fuelwood is at its highest; and trail construction and increased numbers of fish improve the picture.

Alternatives E-Departure and I provide an intermediate situation. Alternative I provides more unroaded areas, trails, and fish; while Alternative E-Departure offers slightly more elk plus a provision for a semiprimitive motorized area.

Effects on Community Cohesion and Community Stability

"Community Cohesion" is an estimation of whether a given alternative will tend to unify or polarize a community. While a diversity of opinions in a community is generally desirable, it is assumed that polarization of the community is harmful and that cohesion is beneficial. It is further assumed that polarization will be caused by the adoption of an

alternative which greatly favors one point of view over others. In contrast, the selection of an alternative that meets to some extent the desires of diverse participants is assumed to produce cohesion.

Judging by this criterion, Alternatives B-Modified and C-Modified would produce polarization. The public response to Alternative E-Departure, the Draft Preferred Alternative, included many negative comments about its "departure" harvest schedule. It is judged that the adoption of Alternative E-Departure would produce polarization. Under Alternative A, existing polarization would not diminish. Alternative I is the one alternative judged likely to promote some degree of community cohesion.

Community stability is judged by two factors.

Continuity of the financial base -- the extent to which tax supported community services will be supported in the future; and

Diversification of the community economy -- the extent to which diversification makes it possible for the community to "ride out" a downturn in one economic sector.

Continuity of the financial base is interpreted from the 25 percent monies and the total employment level. Alternative B-Modified meets this goal best. Alternative C-Modified, and Alternative E-Departure after the second decade, do not meet the goal well. Alternatives A and I meet the goal adequately.

Concerning diversification of the economy: Alternatives B-Modified and C-Modified meet the goal minimally. Alternative A is stronger, and Alternatives E-Departure and I perform the best.

Effects on Minorities and Women

The Native American Religious Freedom Act requires Federal agencies to evaluate their policies and procedures in consultation with Native American leaders in order to protect and preserve Native American religious sites and areas through cultural resource surveys and contact with the tribes. No conflicts were identified with the Tribes Comprehensive Plan. The Forest and Grassland are not recognized as having a significant impact on the resources or the socio-economic concerns for the Warm Springs Reservation.

Changes in employment and employment patterns may have effects on minorities and women. As employment in general increases or decreases, everyone, including minorities and women, will be affected. The question here is whether there are any disproportionate effects on minorities or women.

In the Forest Service, hiring of women and minorities is affected by the Equal Employment Opportunity (EEO) program. It is assumed that if the Federal workforce increases, women and minorities will benefit through the EEO program. Conversely, a decreased Federal workforce may reduce employment opportunities for minorities or women as for all potential employees. As shown in Table 4-9, projected workforce levels vary only slightly among the alternatives, with Alternative B-Modified having the highest number of employees and Alternative C-Modified the lowest. Overall, the difference among alternatives is small.

Another Federal provision relates to contracts set aside for disadvantaged minority contractors (8A contracts). As Federal budgets increase or decrease, the money available for such contracts will rise or fall. However, overall effects of the "8A" contracting in our area are small.

In employment in the private sector, there is no clear evidence that Forest decisions would disproportionately affect minorities. Women might be disproportionately affected by the selection of an alternative. Women's careers tend to be concentrated in clerical, trade and service fields, with significant numbers of women also employed in the mills (State of Oregon, 1984a and 1984b). Women are more likely than men to work part time, frequently in trade or service occupations. If these areas of employment are affected by a given alternative, women might be affected.

Alternative B-Modified would produce a slight increase (three percent) in mill employment which might increase full-time job opportunities for women. Alternative C-Modified would decrease mill employment by three percent and might decrease these job opportunities. No other alternative affects mill employment significantly.

The trade sector (see Table 4-22) is used as an indicator of part time employment. Alternative E-Departure produces the largest increase, a four percent gain. Alternatives B-Modified and I produce a three percent increase. Alternatives C-Modified (+2 percent) and A (+1 Percent) produce gains, but the increases are not as large as those created by the other alternatives. These alternatives all produce, in varying degrees, an increase in part time jobs which might employ women.

Cumulative Effects

The previous sections have examined the socio-economic effects of the Forest upon Crook and Harney counties, the Zone of Primary Influence. (Table 4-22 also includes Wheeler County in the totals, but the Wheeler County contribution is small.) But the Forest's effect extends farther; and many other factors affect the Crook/Harney county region.

One million board feet of Ochoco NF ponderosa pine creates eleven jobs and an income of $220,000 (1987 dollars) within the two county area. But since 10 percent to 15 percent of the pine will be milled elsewhere, and some milled lumber will be remilled elsewhere, the total contribution to the Oregon economy is estimated to be fourteen jobs and a payroll of $290,000.

Other species are more likely to be milled outside the two county area. A harvest of one million board feet of "associated species" will create three jobs and $60,000 in income in Crook and Harney counties. Five jobs and $100,000 in income will be created statewide.

Therefore, when the Extended Area of Influence is considered, differences in timber harvest levels take on more important effects. The employment gains from Alternatives B-Modified, E-Departure, I, and A will be magnified. Likewise, the employment loss from Alternative C-Modified will be increased.

Just as the Ochoco National Forest creates effects in more distant counties, the decisions of other Forests affect local economies. Crook County in particular boasts a large remanufacturing industry. The plants process 120 MMBF of milled lumber each year. Since 40 MMBF to 60 MMBF of this amount comes from the Ochoco NF, 60 MMBF to 80 MMBF originates elsewhere -- primarily on other eastside National Forests.

It would be desirable to estimate the future total ponderosa pine harvest for eastern Oregon. These figures are not easily obtained. However, Table 4-25 contains some figures for anticipated total harvests for the seven National Forests in eastern Oregon.

TABLE 4-25
Total Timber Harvest 1/

Planned Timber Sale Program Quantity from Draft Forest Plans	1 41 MMBF
Average harvest, 1980-1988	1 15 MMBF
Average sales, 1980-1988	1 24 MMBF

1/ Includes Deschutes, Fremont, Malheur, Ochoco, Umatilla, Wallowa-Whitman, and Winema National Forests

It can be seen that total volume for these Forests is predicted to increase by 10 percent to 20 percent. The total ponderosa pine available for remilling may not share this rate of increase, however, for two reasons.

Ponderosa pine is decreasing as a percentage of the total harvest on the Ochoco NF and on some other Forests; and

The ponderosa pine which will be harvested will tend to have a smaller diameter and more defects than the pine harvested in the past.

Given these considerations, it is not clear whether the ponderosa pine available for remanufacturing will slightly increase, stay the same, or slightly decrease.

Because Crook County remanufactures do purchase material from a wide area, an increase in the Ochoco harvest might be compensated for by a decrease in the purchase of other material. Therefore, the increased employment projected for Alternatives B-Modified, E-Departure, I, and A might be diminished. Similarly, the decrease in harvest under Alternative C-Modified might result in a smaller decline in employment.

The timber industry can also be heavily influenced by national environmental, political, or economic factors -- and, increasingly, by international factors. Examples of such factors are the final classification of the spotted owl, a rise or fall in the Federal Reserve prime interest rate, or decisions regarding imports or exports of logs or lumber. The socio-economic effects from these quarters will affect and may even dominate the effects which are predicted above for the various alternatives.

Mitigation

It has been mentioned above that ponderosa pine will tend to be smaller and to have more defects in the future. For Alternative I, silvicultural prescriptions have been altered on parts of the Forest to yield a larger tree with fewer defects.

Other mitigation measures designed to improve future timber yields are discussed in the Timber section of this chapter.

Conflicts With Other Plans and Policies

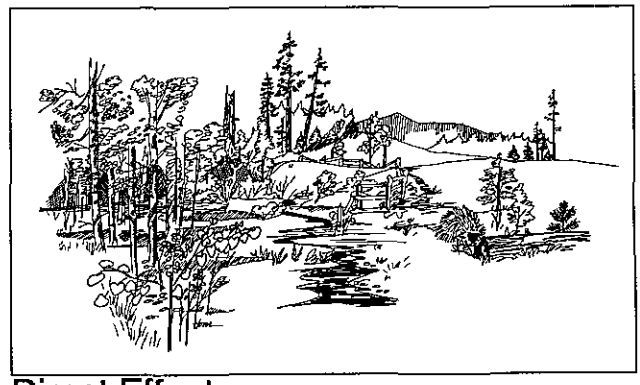
The Crook County - Prineville Area Comprehensive Plan, issued in 1978, sets forth many objectives. Protection of the current timber industry is a primary topic, but concerns for grazing for livestock and wildlife, recreational opportunities, and environmental needs (especially protection of water and soil) are all mentioned. As an overall goal, the county plan states:

> "It shall be the policy of the county to support forest land use and management decisions which maximize the present level of benefitting uses; specific emphasis shall be on timber production to sustain the existing forest products industry, forage production to maintain at least the existing levels of livestock and wildlife habitat, protection of water quantities and quality and to maintain existing dispersed recreation levels in coordination with the USFS planning and management programs." (p. 53)

Alternative C-Modified would conflict with the goal of "timber production to sustain the existing forest products industry." Or, conceivably, the phrase "existing forest products industry" could be interpreted to mean that the planned harvest level should match the 1977 harvest level. Every alternative would conflict with such an interpretation since the 1977 harvest level was 143 MMBF.

No conflicts are seen with plans of any other agencies or groups.

Soil



Direct Effects

Timber harvest and road construction have the greatest potential to affect the soil through compaction, displacement, or erosion. Concentrated grazing and recreation use may adversely affect soil especially in sensitive riparian zones. Intense fire may volatilize soil nutrients.

Effects of Timber Harvest

Due to the relatively gentle terrain on the Ochoco National Forest, tractor yarding is the most common method of timber harvest, especially on slopes under 30 percent. Multiple trips over the soil with a tractor or rubber-tired skidder can cause detrimental soil compaction and displacement. Fifty percent of the acres accessible to tractor harvest exhibit a high compaction hazard (SRI,1977).

Soil compaction reduces site productivity by reducing the air space in the soil, creating a physical barrier to plant roots, and changing the infiltration and percolation rates of water into and through the soil. Displacement occurs when the fertile surface soil is removed or pushed aside, exposing the subsoil. Displacement can occur over large areas during machine site preparation or on smaller areas on skid trails and landings.

Machine piling of slash can triple the area of ground disturbed over that caused by timber harvest, greatly increasing soil damage caused by compaction, puddling and displacement. Dramatic growth reductions have been demonstrated on areas where surface soil has been pushed into windrows or piles along with stumps and logging debris. Since surface soil displacement or removal is a long-term, or nearly permanent, site disturbance, effects on nutrient cycling are significant. (Class 1976; Haines, et al, 1975).

The amount of soil compaction will depend on the number of acres affected by ground-based logging equipment (e.g. tractor or rubber tired skidder) and by the method of post-harvest site preparation. Cable yarding systems move logs to the landing by dragging or partially suspending the logs with cables. These systems cause less soil disturbance than tractor yarding and can be used where tractors are not suitable. Road density is usually less with cable systems since yarding can be done over longer distances with a stationary machine.

For each harvest entry, the extent of soil disturbance depends on the logging system and associated road network, terrain and soil factors, volume of timber removed, size of logs, weather, soil condition and skills of individual equipment operators. The most complex, expensive yarding systems are designed to operate in the steepest terrain and to have the least impact in terms of soil compaction and displacement; thus, careful practices in difficult, erosion-prone terrain may have soil erosion impacts comparable to poor practices carried out on naturally stable flat ground.

Historically, compacted bare soil has occurred (as shown in Table 4-26) from various logging systems and haul roads.

TABLE 4-26
Yarding System Effects on Soil Condition

	% Bare Soil	% Compacted Soil
Tractor yarding	35	27
w/ haul roads	12	6
Total	47	33
Cable yarding	6	6
w/ haul roads	12	12
Total	18	18

Source Sidle, R C 1980 "Impacts of Forest Practices on Surface Erosion" PNW 195, pgs 5 9

Management standards and guidelines allow no more than 20 percent of an area to be displaced or compacted; a Forest goal is to eventually have no more than 10 percent in such a condition, and the Forest has an aggressive program of skid trail designation and tillage of compacted soils (approximately 1,500 acres annually) in order to meet these standards over the long run. Rehabilitation of previously compacted soils will take at least 5 decades, as it will occur during subsequent timber sale entries. This is further complicated with management of existing stands (such as with overstory removal or uneven-aged management) because tillage is logistically very difficult; machinery for tilling also damages existing crop trees. The ideal time to till for compaction is during the regeneration phase of the rotation (e.g. clearcut or shelterwood). Destruction of existing crop trees in order to relieve compaction is done only under the most severe conditions, as the productivity lost from tree removal may outweigh the benefits of relieving the compaction.

Even with compliance with standards and guidelines (20 percent maximum compaction), overall acres of compaction on the Forest will increase in the short term as previously unentered timber stands are harvested. The Forest will only begin to reduce the acres when previously entered (and compacted)

areas are re-entered and rehabilitated. As this is predicted to take at least five decades, it emphasizes the need to maintain an aggressive rehab program. Because the ideal time to till for compaction is during stand regeneration (clearcut, shelterwood, etc., before new seedlings are established), those alternatives that provide for extensive acres of uneven-aged management maintain an "opportunity cost" because the tree stand is never cleared and replanted. Machinery of sufficient size to relieve compaction is also too large to maneuver around existing crop trees under most conditions encountered, therefore presenting conditions that may favor long term maintenance of compacted soils. Overall, the alternatives can be rated in terms how well they manage for compaction over time, based on rate of timber harvest, percent of tractor versus skyline logging, use of even-aged versus uneven-aged management, and total acres available for timber harvest.

Alternative A projects the best overall trend in reduction of soil compaction because of the high percentage of skyline acres scheduled for timber harvest and the small percentage of uneven-aged management. Alternative C-Modified calls for a high percentage of tractor logging, because the majority of steep ground areas are reserved for unroaded recreation and not available for timber harvest. It also provides for extensive use of uneven-aged management, therefore complicating efforts to rehabilitate existing compacted areas. Consequently, it has the worst overall trend in future management of compacted soils.

Effects of Road Construction and Reconstruction

Roads are the major nonpoint source of sedimentation. New road construction during the planning period will affect the soil resource by removing land from production and dedicating it to a portion of the transportation system.

Road construction activities cause the disturbance and removal of soil, which can result in soil erosion and increased sediment in streams. This effect varies by the amount of roads constructed, the season of construction, the types of soils, and the steepness of slope on which the roads are constructed. Maintenance of roads can also cause sedimentation in the streams as grading disturbs mineral soil and results in soil loss through erosion.

Roads constructed during the wet period of the year (November through May) will encourage surface runoff, erosion, and sedimentation. New roads are highly erodible during the first rains and/or snowmelt following construction.

Roads having high cutbanks produce more sediment than roads with low cutbanks. Freezing and thawing, heating and cooling, and raindrop action dislodge soil particles which ravel into drainage ditches and are transported to streams. Road construction on slopes exceeding 70 percent produces gravelly sidecast material that can bury downslope vegetation and create a droughty condition, resulting in reduced soil-site productivity. Sidecast can cause overloading of the fill slope and subsequent failures.

Improper compaction and logs and debris in fills can result in road failures. Improper location and inadequate numbers or sizes of drainage facilities can increase the incidence of road failures and road surface erosion.

Roads lacking adequate surfacing act as a transport mechanism delivering the bulk of the sediment to streams. In addition, roads with insufficient rock surfacing "pump" soil to the surface which erodes during winter use. The most critical conditions exist on roads constructed on soils high in clay.

Road reconstruction on the Forest is a source of sediment that occurs when an old road is cleared of protective vegetation.

Similar to new road construction exposed soils will tend to erode for one to several years after reconstruction.

Since most of the Forest's transportation system is already in place, new construction does not vary significantly by alternative (see Table 2-8, Chapter 2).

TABLE 4-27
Activity Effects on the Soil Resource Based on Historical Conditions

		ALTERNATIVES					
Activity	Unit of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
Acres Logged By Decade	M Acres						
Decade 1		183	162	157	140	144	146
2		141	181	147	135	147	147
5		131	196	115	171	140	164
Tractor Acres	M Acres						
Decade 1		149	130	127	131	105	132
2		99	119	109	101	113	91
5		93	154	90	140	109	141
Skyline Acres	M Acres						
Decade 1		34	32	30	9	39	13
2		42	62	38	39	35	56
5		39	42	25	31	31	13
Machine Piled Acres	M Acres						
Decade 1		66	58	56	50	52	52
2		51	65	53	49	53	53
5		47	70	41	62	50	59
Acres Burned - Rx Activity Fuels	M Acres						
Decade 1		165	146	141	126	129	131
2		127	163	132	121	133	132
5		118	176	104	154	126	147
Acres Burned - Rx Total	M Acres						
Decade 1		252	257	258	246	252	267
2		256	231	249	252	256	263
5		249	259	221	256	249	293
Existing Compaction	M Acres						
Decade 1		102	102	102	102	102	102
2		102	102	102	102	102	102
5		102	102	102	102	102	102
Future Compaction	M Acres						
Decade 1		49	43	42	43	35	44
2		33	39	36	33	37	30
5		31	51	30	46	36	50
Future Soil Tillage	M Acres						
Decade 1		19	17	17	17	14	17
2		13	15	14	13	15	12
5		12	20	12	18	14	20
Bare Soil - End of Decade	M Acres						
Decade 1		15	13	13	13	11	13
2		10	12	11	10	11	9
5		9	15	9	14	11	15
Sediment	M Tons/Yr						
Decade 1		19	17	18	17	15	17
2		15	22	13	21	18	17
5		13	21	12	19	15	19

The potential to increase sediment production lies mainly in roading currently unroaded areas since new road construction adds more sediment than existing roads and the unroaded areas have higher erosion hazard rates than surrounding areas. Examples of unroaded areas with 65 to 85 percent of the area exhibiting severe or greater erosion hazards are Rock Creek, Green Mountain, and Cottonwood. More than half of Lookout Mountain, Silver Creek, and Broadway unroaded areas exhibit severe erosion hazards.

Alternatives with the least impact on these unroaded areas are C-Modified and E-Departure. Alternative I has a moderate potential of impacting these sensitive unroaded areas, while Alternatives No Change, A, and B-Modified pose an increasing risk of soil loss from these areas (see Table 2-8, Chapter 2).

Effects of Grazing

Grazing allotments can be a source of soil compaction and erosion where livestock are concentrated, such as around water sources and riparian areas.

Historical evidence indicates that excessive grazing over long periods of time, or grazing on soils that are too wet can lead to soil damage such as: 1) surface erosion, 2) soil compaction, 3) soil puddling, and 4) nutrient loss.

Cattle use can keep the surface (one to two inches) of soil layers compacted, but generally not any deeper (Alderfer & Robinson, 1947). Natural restoration through freezing-thawing and pioneering vegetation will generally correct, in a few seasons, the type of surface soil compaction done by livestock.

It can be assumed that as we expand the transitory range with more timber harvesting and increase the utilization of existing forage through water developments, additional grazing will follow and negative soil impacts will increase.

The number of Animal Unit Months (AUM'S) does not vary greatly among the alternatives (see Table 2-8, Chapter 2). With adoption of more restrictive utilization standards in riparian areas and range improvements designed to disperse livestock, soil compaction in riparian areas should be reduced.

Effects of Recreation

Recreational impacts on the soil resource have historically been minor on the Forest and Grassland but are increasing, especially with motorized use of All-Terrain Vehicles (ATV's) and other Off-Road Vehicles (ORV's); unregulated use of these has high potential for soil impacts, especially erosion in critical riparian areas. Concentrated recreational use will tend to compact soils and channel runoff. Overall dispersed recreational use will increase as access is provided into additional areas. Recreation use varies by alternative, Alternatives I and C-Modified (and to a lesser degree B-Modified) emphasize recreation strategies that include high levels of trail construction for nonmotorized and motorized, winter and summer use (see Table 2-8, Chapter 2). These three alternatives have equal levels of trail construction for All-Terrain Vehicle use and are, designed to better regulate existing use which is currently unregulated on a majority of the acreage on the Forest and Grassland. The impacts to soils in the trails themselves may increase, but better management for the off-trail areas would result and this facilitates monitoring.

Effects of Fire

The effects of fire on soil are highly variable depending on: (1) the intensity and duration of the fire, and (2) the transfer of heat in the soil (dependent on the physical properties of the soil affected). Significant beneficial effects of low to moderate intensity fires are (1) exposure of mineral soil/ash seed beds for natural tree regeneration, (2) improved nutrient cycling, and (3) reduced levels of some pathogenic microorganisms. Significant adverse effects of high- to extreme-intensity fire are (1) accelerated erosion (due to excessive mineral soil exposure and/or creation of hydrophobic conditions), (2) excessive nutrient volatilization (especially nitrogen and potassium), (3) loss of beneficial microorganisms, and (4) loss of organic matter for nutrient holding capacity of soil. (Boyer and Dell, 1980).

Under extreme compaction, air and water movement can be altered to the point that it affects the biological and chemical properties of the soil which ultimately affects the availability of plant nutrients.

Topsoil removal and intensive burning and cold soils can modify a soil source and create a nitrogen deficiency. Nutrient losses from fire management will be most significant on high elevation, volcanic ash soils. This is because nitrogen deficiencies are most common on colder soils (higher elevations) and on sites where topsoil has been displaced or altered through intense burning. This is most pronounced when a stand reaches crown closure--the period of greatest demand on soil nitrogen supply.

Although the total acreage of prescribed burning is large, including treatment of natural as well as activity fuels, only 20-30 percent of this area is likely to fall into the intensely burned category, or approximately 61,000 to 66,000 acres depending on the alternative. This is not a wide range and does not pose a high risk to the soil resource given the Forest's commitment to fire suppression and fuels management.

Indirect Effects

Changes in soil characteristics will often affect water quality. An increase in soil compaction, erosion, or displacement can cause an increase in stream sedimentation. The effect of sedimentation on fish habitat will be discussed in greater detail in the water section (see Effects on Water, this chapter). Alternative No Change poses the greatest risk in the first decade; however, over time, Alternative B-Modified will likely have a greater impact. Approximately 50 percent of the runoff from the Forest is captured and stored in two reservoirs. Increased sedimentation could reduce the useful storage life of the Ochoco and Prineville reservoirs (Table 4-28).

The values in the table above are estimated to be about seven percent above background or natural levels. Whether this total amount of sediment is delivered each year to the reservoirs or is entrained in streambanks or channel gravels to be flushed into the reservoirs during major storm event is open to discussion. Overall the effects on reservoir storage is small.

Reduced site productivity caused by compaction, volatilization, or erosion can, in turn, reduce the growth rate of future stands and can influence the density and diversity of both cover and forage for wildlife. The actual reduction of site productivity is difficult to predict due to the interrelationship among stand stocking, genetic improvement, mitigation measures, length of line, natural recovery, and climate, among others. Though potential impacts to site productivity are real, they do not vary significantly by alternative.

Cumulative Effects

The cumulative effects of land management activities on adjacent and intermingled ownerships was considered. No measurable off-site effects on soil are anticipated. Compaction, the major effect on soil, is confined on-site. Soil erosion from adjacent ownerships may result in slight increases in stream sedimentation. Sedimentation of streams is discussed in more detail in the Water Effects section, this chapter.

Soil erosion and sedimentation in the headwaters of streams will affect the downstream segments of the drainages. Assuming more roads are constructed

TABLE 4-28
Annual Estimated Sediment Contribution

	Cubic Yards of Sediment Input by Alternative					
Reservoir	NC	B MOD	E-DEP	I Preferred	A	C MOD
Ochoco	250	235	240	230	205	230
Prineville	750	700	705	690	610	690

than are closed each year, sedimentation from road construction and maintenance will accumulate over time.

Alternatives I and C-Modified, which will close a large proportion of roads seasonally or yearlong, will have slightly less impact than the remaining alternatives.

As pointed out in Table 4-28, the contribution of sediment from the Forest is estimated to be approximately seven percent above background levels. It is unlikely this proportionally increased sedimentation will increase over time. However, the accumulation of sediment in both Ochoco and Prineville Reservoirs will have a cumulative effect on the storage capacity of the reservoirs over time, reducing their effective service life by an unknown number of years.

The effects of soil compaction following tractor harvest can last longer than 40 years (Power, 1974). Silvicultural prescriptions that require more than one entry, such as shelterwood cuts, can potentially compact a greater percentage of the area than harvest methods where only one entry is necessary. Salvage harvest is potentially the most damaging.

Local documentation on soil compaction exists from study of a heavy partial cut of old-growth ponderosa pine which removed most of the overstory from a stand of young pine on the Ochoco National Forest in 1961 (Big Summit R.D.). Soil compaction from logging equipment was readily measurable 16 years after cutting. Soil density in skid trails at depths of three and six inches averaged 18 percent higher than the densities in undisturbed soils. At the nine and twelve inch depths, skid trail density was nine percent greater than the density at the same depths in undisturbed soils. Growth of residual young pine trees related negatively to the intensity of soil compaction in the root zone. Moderately impacted trees showed a six percent reduction in growth rate and heavily impacted trees showed a twelve percent reduction over a 16-year period (Froehlich, 1979).

In another study supporting growth loss from compaction in the Coast Range of Oregon, the effects of skid roads kept soil heavily compacted 32 years after logging on 25 percent of the harvest area. An overall volume loss was 11.8 percent for the total area. (Wert & Thomas, 1981).

Recent research in progress reports statistically significant different soil bulk density, radial growth and tree height between lightly and heavily disturbed portions of harvest units. Growth was slower on heavily disturbed areas. Decreased growth relationships with increased soil bulk density is reported. (Geist & Seidel, 1984.)

Studies show that multiple entries have the potential to cumulatively reduce productivity more than single entries (Chambers, 1977).

Currently it is estimated that about 102,000 acres have been detrimentally compacted on the Forest. This is approximately 12 percent of the total acres. This value is expected to rise over the next two to four decades to between 18 and 20 percent under all alternatives. Peak flows were increased approximately 35 percent on a harvested drainage where disturbed areas, including roads, cutslopes, landings, etc., equalled 12 percent of the harvest area (Harr, et al, 1979). This situation may have an indirect cumulative effect on channel stability.

Finally, as more trees are harvested, chances are proportionately greater of removing more topsoil, cutting on colder sites, volatilizing more nitrogen through burning, and in compacting more soils, reducing tree root development. Loss of soil nutrients and organic matter through short rotations and high levels of tree utilization, plus complete slash disposal is another concern. But recent research from the Inland West (Harvey, et al,) concludes that "open grown, short rotation forests (forests with low competition, maximum soil volume per tree, using pioneer or seral species and a potential for understory symbiotic nitrogen fixers), with appropriate vegetation management seems a good biological approach to managing infertile, second growth forests with low organic matter reserves." "Guiding (our) actions with the use of a reasonable biological perspective represents an opportunity to maintain or even improve harvested sites and their soils as a firm foundation for future forestry."

Because soil productivity and growth losses from harvest activities may not always occur immediately, the effects of many of our activities must be considered as cumulative. Soil compaction created from harvesting may mean that a future stand to be regenerated in 100 years may need more time to achieve the outputs normally projected for 100 years. This has the potential of offsetting much of the gain to be expected from genetic tree improvement and silvicultural thinning. Alternatives I and C-Modified both have extended rotations on a majority of acres available for intensive timber management and exhibit the least potential for this cumulative, significant effect. Alternatives No Change, A, B-Modified, and E-Departure all have high potential for cumulative effects, because of significantly shorter rotations on a majority of harvestable acres. On the other hand, those alternatives that manage for long rotations commit the Forest to the use of large logging equipment into the future, one of the often unrecognized positive benefits associated with short rotation management is that significantly smaller yarding, skidding, and slash disposal equipment are adequate for log processing.

Mitigation Measures

Management of organic material as a source of future soil productivity is discussed in depth under Effects on Forest Residues, this chapter. In summary, specific levels of residues remaining after activities such as logging, precommercial thinning and slash treatments are prescribed for major forested species types, based on the most recent research available (Harvey, et al, 1987). Continuing research on soil management will be critical for ascertaining additional mitigation measures to be used in future forest management.

Alternatives with the most roads, especially new roads in present unroaded areas, will require the following kinds of mitigation:

> Special efforts should be made to minimize road standards by rolling the grade to conform to the topography, preferably at or near ridge crests and benches to minimize cuts and fills. On steep slopes, end hauling of excavated material will be done to prevent side cast waste which buries downslope vegetation. Eroding cut banks will be mulched, seeded and fertilized. Deep rooted species on cut banks are desired. To prevent loss of soil on cutslopes, stabilization efforts such as rounding off the upper two feet of the bank will prevent ravelling and sloughing of material into the ditch. Frequent culverts with energy dissipators on the outlets will be installed on steeper grades. Road rock should be spread before the wet season. These measures have been found to be very effective over a wide variety of situations on the Forest.

Additional mitigation measures aimed at reducing sediment yield consist of leaving unmerchantable material on the ground and limiting slash disposal to minimum levels needed to meet site preparation and slash disposal needs. Prescribed burning will often have some unavoidable effect on increased sediment if soil hydrophobic conditions occur from extremely hot burns. Much of this impact can be avoided (and is very effective) by burning when soils are moist, usually between May 15 and July 15.

Other forms of mitigation designed to offset effects of soil compaction and associated increased sedimentation follow.

For some soils, maximum compaction occurs at high soil moistures. Field operations can be done at times when soil moisture contents are lowest. Some studies have shown that compaction occurs over a wide range of soil moistures, especially on ash soils. The effectiveness of this measure will vary considerably.

Grass planting can accelerate the drying of a soil.

Equipment usage can be restricted to snow pack or frozen ground conditions.

Controlled skid trails can be designated for ground based logging vehicles, including the following skid trail planning measures and considerations:

- Keep trails as narrow as possible (eight feet).

- Use no blades on tractors during skidding.

- Construct trails where possible without blading (the mashed-down brush and reproduction will inhibit compaction and erosion).

- Match machine size to the size of material removed will lessen soil compaction.

- Skidder operators should conscientiously minimize maneuvering that causes wide disturbance areas. Directional felling of trees toward or away from a trail to herringbone patterns helps reduce skidder maneuvering and load pivoting. This reduces the amount of soil compaction and bare soil exposed.

- Limb trees before skidding to decrease the amount of bare soil exposed.

- Season and weather conditions can affect soil and crop tree damage. Wet soils will result in increased root damage from skidding. Terminal shoots are tender and easily broken in June. Logging on snow will reduce root damage but care needs to be taken under freezing conditions to reduce breakage of stems made brittle by low temperatures.

- Machine plant shrubs on road cuts.

- Restoration on rocky soils is almost impossible.

- Mitigations, such as designated controlled skid road spacing of 100 feet, leads to 11 percent of an area in skid trails. Spacing of 150 feet lead to seven percent of an area in skid trail. In combination with haul roads and fuel treatments, 30 percent to 10 percent of an area in skid trails for tractor and cable harvests, respectively, is easily foreseeable.

- Tillage of compacted soils where compaction occurs. This is not feasible on rocky soils, but is very effective on a wide variety of soils and conditions.

- Rely on natural forces such as:

  Freezing and thawing which tend to increase the porosity of compact soil through imbibition of water in soil pores during periods of freezing temperatures.

  Shrinking and swelling in clayey soils. A swelling increases porosity while shrinkage causes cracks to open allowing for root penetration and water infiltration. Soils which shrink on drying often form dense layers. An example of such soils is found in the T3, T55, T7, and T8 land types (Paulson, Ochoco Soil Resource Inventory, 1977).

  Decaying root materials increase soil porosity.

Due to compaction occurring as a result of logging and slash disposal equipment, we can summarize some timber harvest mitigation built into the analysis for all alternatives, along with the Best Management Practices:

Compaction can be reduced by limiting equipment to designated skid trails during drier seasons of the year, or by use of other methods such as cable logging or nonmechanical slash disposal (burning). Some measures have been built into the planning process by requiring designated skid trails or cable logging and nonmechanical slash disposal on areas managed at or near maximum timber production. On other areas, machine use would be limited to when potential for compaction was in an acceptable level defined as a 15 percent increase in bulk density on 20 percent or less of area on residual soils, and a 20 percent increase in bulk density on 20 percent or less of area on volcanic ash soils. Some areas of existing compaction can be reduced by scarification, but this does not return the soil to original condition.

The following mitigations and Best Management Practices are very effective if proper monitoring and administration occurs:

-Cable logging on slopes greater than 30 percent reduces site disturbance by three times over tractor logging. The result is reduced erosion and displacement. On slopes greater than 30 percent, cable logging should ensure that logs have one-end suspension.

-Dry weather logging creates less damage to productivity than wet weather logging. Restricting activities during periods of high soil moisture has worked quite well on residual soils but will not be effective on ash soils, where traffic path controls should be used. Logging on frozen or snow-covered ground may also be a good opportunity.

-Landings should be kept as small as feasible and tilled, seeded and mulched.

-Contract administration may need to be increased to comply with objectives of Best Management Practices.

-Tillage to break up soil compaction along with water flow diversion and dispersion structures (i.e. waterbars) and seeding should be done to retard erosion.

-Monitor timber growth associated with different timber practices. Monitoring will indicate if practices need to be adjusted or more mitigation added.

-Cooperate with research agencies to install long term studies into this problem. Adopt new research results in revisions of this Plan.

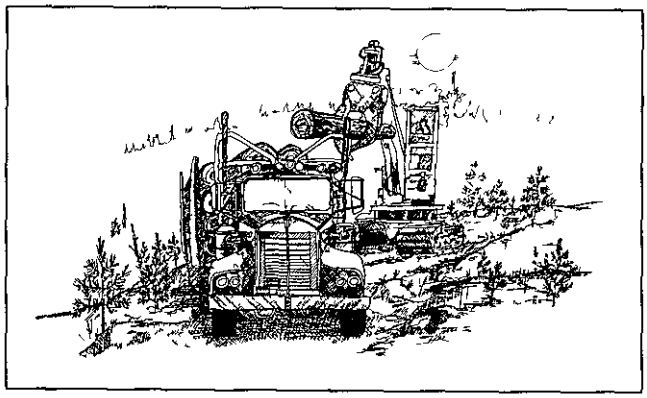
-Maintenance of trails and rehabilitation of damaged areas will help to reduce the negative impacts associated with recreational pursuits, especially Off Road Vehicle use.

All of the mitigation measures/Best Management Practices (BMP's) discussed above are highly effective (90 percent or greater) at preventing or reducing impacts to soil resource values on the Forest. However, the degree and quality of implementation is highly variable, ranging from poor to excellent. Unexpected or unusually severe climatic events, availability of funding and manpower, knowledge and understanding of the BMP's by both operators and administrators, to name but a few, are reasons why many of these BMP's are often only 60 to 80 percent effective.

Conflicts with Other Plans and Policies

The Environmental Protection Agency (EPA) has certified The Oregon Forest Practices Act rules and regulations as best management practices (BMP's). The State of Oregon has compared Forest Service practices with these state practices and concluded that Forest Service practices meet or exceed state requirements. As state practices change, comparisons are made to ascertain whether Forest Service practices meet or exceed these changes. Monitoring and evaluation will determine the need for changes in BMP's and/or state standards. Local soil conservation groups, the irrigation district and the BLM have been actively informed, during the planning process, on matters potentially affecting their programs and have had the opportunity to submit into the Final Plan. There are no expected conflicts with other agencies' plans or policies.

Timber



Timber is a major component of the affected environment in central Oregon. Alternatives for management of the Ochoco National Forest will have significant effects on current and future inventories and growth of timber for existing and future generations of users (direct effects). Even though in the technical sense these are not in themselves environmental effects, local concern for current and future supplies of timber constitutes a need to disclose adjustments in timber harvest scheduling as an "environmental consequence."

Harvest activities associated with these alternatives will also affect the structure and species composition of timber stands in the future. In turn, timber harvest and related activities (including thinning, planting, slash treatment, and other cultural treatments) have significant effects on nearly all other components of the environment (indirect effects). Alternatives No Change, B-Modified, E-Departure, I, A, and C-Modified provide significantly different levels of timber production from the Ochoco National Forest (see Chapter 2). Increases or decreases from current programmed harvest levels can have significant and cumulative effects on both the socio-economic setting in central Oregon and on long-term productivity of timber and other forest resources.

Direct effects of the alternatives on timber are provided in detail in this section. Discussions revolve primarily around public issues, concerns and opportunities (ICO's) developed during early stages of the environmental analysis process. In summary these ICO's include:

Sustained Yield/Even-Flow and Departure;

Timber Supply and Allowable Sale Quantity (ASQ);

Uneven-aged Management; and

Ponderosa Pine Supply and Tree Size.

The indirect and possibly cumulative effects associated with timber include the long term changes that will occur to the "managed forest," as well as those on other environmental components. These other components or resources are only briefly described in this section, with extensive use of cross-referencing to other discussions on effects where more detailed information can be found. Soils, Water (including riparian), Biological Diversity, Fuelwood, Old Growth, and Socio-Economic are important environmental components that are significantly affected by timber harvest and related activities.

Direct Effects

Productive timber stands that are removed from intensive management (or scheduled for reduced intensity) to meet other resource objectives reduce the supply of harvestable timber, and therefore the long term sustained yield and ASQ. There are approximately 572 thousand acres of "forested land" on the Ochoco National Forest (see Chapter 3, - Timber). Approximately 39.4 thousand acres have been withdrawn from consideration for timber production due to legislation, suitability, and regeneration difficulty, leaving a net of about 533 thousand acres as tentatively suitable. The six alternatives described in Chapter 2 allocate lands to various resource emphases (e.g. unroaded recreation, wildlife, riparian). Depending on the emphasis, intensities of timber production are adjusted down, which again reduces the long term sustained yield and ASQ from the Forest. Table 2-8, Chapter 2, displays long term sustained yield, ASQ, and other data relevant to understanding effects of the different alternatives on timber as an environmental component.

Growth and inventory of forest stands is measured in units of cubic foot volume because it is independent of numerous product requirements occurring

within a locale, region, or the nation as a whole. Board foot volume measurement varies with size of trees and is designed for certain product specifications and current technology. Young stands that have been regenerated cannot be measured in board foot or equivalent units of measurement, attempting to do so would underestimate the biological potential of timber producing lands and make future growth projections impossible. It is presently Forest Service Policy (FSM 1922.15) to use cubic foot volume as a measurement of long-term sustained yield, as well to regulate the amount of timber to be offered and sold as specified by the allowable timber sale quantity (ASQ), in order to respond to changing technology and product requirements projected for the future (RPA,'85).

Departures from the ASQ (in cubic feet) are allowed under certain circumstances (36 CFR 219.16), including those where implementation of the normal base sale schedule would cause a substantial adverse impact upon a community in the economic area in which a forest is located. By definition, departure requires a future decrease in the timber sale and harvest schedule to bring the ASQ in line with long-term sustained yield. Harvest levels are monitored and adjusted every ten years to insure that long-term sustained yield is not reduced. See Appendix B, Section 7 for further discussions on timber harvest projections. See Chapter 2 for discussions on "potential yield" of timber.

Local wood manufacturing facilities are currently tooled to process large diameter timber, even though some conversion to small log manufacturing has begun. Ponderosa pine is the species favored for local mills, and both primary and secondary manufacturing facilities are currently dependent on large pine (see Effects on Social and Economic, this chapter). Large, old growth ponderosa pine is a finite resource. Extremely long rotations or cutting cycles are required to grow the size and quality of wood favored by local industry and it is projected that current harvest levels of large, tight-grained ponderosa pine are not biologically sustainable for more than a few decades, especially within management requirements established for the Forest. Specific cultural techniques are available to simulate, as near as possible, both size and quality desired (see Mitigation Measures), but harvest reduction (from current levels) of large diameter pine is inevitable. This species (ponderosa pine) is also desirable for other reasons (including aesthetic), and conservation of old growth ponderosa for future generations is a public concern from both industrial and environmental perspectives (see Effects on Scenic Resources, this chapter). There will be a reduction in size and quality of timber produced with all alternatives. Large trees (18 inches in diameter or larger) are necessary for quality wood production with current technology. The alternatives presented in Chapter 2 provide varying levels of current and future quality wood, these levels are primarily a function of lands available for timber production, as well as extended rotations (or cutting cycles) designed to provide size and quality attributes.

Silvicultural systems (even- versus uneven-aged management) used on the Forest (especially ponderosa pine) affect future stand structure and species composition, forest health, harvest systems, slash disposal, productivity, forest succession, and numerous other factors associated with timber production. Silvicultural systems also affect public acceptance (or lack thereof) of intensive timber management on the Forest. Even-aged management (especially clearcutting) has been increasing on the forest over the last decade for numerous reasons (see Appendix E, Selection of Harvest Cutting Methods). Public concern has been instrumental in development of alternatives which include extensive use of uneven-aged management in stands biologically and logistically suitable.

Effects by Alternative

Alternative No Change

Alternative No Change provides the largest number of acres suitable for timber production (534 thousand acres), but has not been adjusted to reflect requirements of the National Forest Management Act of 1976. For this reason it is not directly comparable to the remaining alternatives, but instead provides a perspective for publics interested in pre-NFMA timber management on the Ochoco National Forest.

Alternative B-Modified

Alternative B-Modified allocates approximately 511 thousand acres of lands to some level of timber production (largest of remaining comparable alternatives). Intensity of timber management activities varies as follows:

484,000 acres	- Full Yield
26,800 acres	- 50 to 99 percent of Full Yield
0 acres	- 1 to 49 percent of Full Yield

Alternative B-Modified also produces the highest timber outputs including long term sustained yield, ASQ, and board feet volume in pine for the first decade. This alternative also uses uneven-aged management as a primary silvicultural system on about 67.5 thousand acres during the first decade, second only to Alternative C-Modified. Additional use of uneven-aged management for this alternative was limited because of timber yield falldowns projected through the analysis process (see Appendix B).

This alternative will provide the most quality timber volume over 18 inches. This is because of the high harvest level and the inclusion of uneven-aged management with a target diameter of 20 inches. It has less volume over 24 inches than does "I" because it has much fewer acres in visual, and management for unique features where the objective is to produce trees larger than 24 inches.

Alternative E-Departure

Alternative E-Departure allocates approximately 495 thousand acres to some level of timber production. Intensity of timber management activities varies as follows:

0 acres	- Full Yield
495,000 acres	- 50 to 99 percent of Full Yield
0 acres	- 1 to 49 percent of Full Yield

As a departure alternative, E-Departure produces timber outputs that decline from 20.6 million cubic feet per year in the first decade, to 19.7 million in the second decade, to 16.1 in the fifth decade, while maintaining a long term sustained yield of 19.3 million cubic feet. Production of ponderosa pine in the first decade is about 87 million board feet per year. Alternative E-Departure uses uneven-aged management as a primary silvicultural system on only about four thousand acres, limited mainly to high visibility recreation areas.

This alternative produces the lowest volume of large, quality material. This is partly due to the low harvest level in the fifth decade, but more important is that this alternative emphasizes economic efficiency (Present Net Value [PNV]) and all stands are harvested to maximize economic return which usually results in harvest before stands reach 18 inches in diameter. There is very little uneven-aged management planned in this alternative, and the only large material produced will be in areas planned for long rotations (recreation or other resource emphasis).

Alternative I (Preferred)

Alternative I allocates approximately 493.7 thousand acres of lands to some level of timber production (not significantly different than E-Departure). Intensity of timber management activities varies as follows:

0 acres	- Full Yield
491,900 acres	- 50 to 99 percent of Full Yield
1,800 acres	- 1 to 49 percent of Full Yield

Alternative I maintains timber harvest (ASQ) at long term sustained yield levels of 19.0 million cubic feet per year. Production of ponderosa pine in the first decade is about 85 million board feet per year. This alternative uses uneven-aged management as a primary silvicultural system on about 62.2 thousand acres during the first decade, differing from Alternative B-Modified through use of longer cutting cycles in high visibility recreation areas, where larger diameter trees are desired.

This alternative produces the most volume in quality trees over 24 inches in diameter. This is because of the large acreage in visual and other management areas with emphasis on producing large trees, plus the emphasis on large trees in the General Forest Management Area. It is second to Alternative B-Modified in total volume in trees over 18 inches in diameter.

Alternative A

Alternative A reflects current direction and allocates approximately 488.6 thousand acres of lands to some level of timber production. Intensity of timber management activities varies as follows:

0 acres	- Full Yield
488,600 acres	- 50 to 99 percent of Full Yield
0 acres	- 1 to 49 percent of Full Yield

Alternative A provides a timber harvest (ASQ) of 19.3 million cubic feet per year, or .2 million cubic feet per year below a long term sustained yield of 19.5 million cubic feet per year. About 90 million board feet per year of ponderosa pine is provided in the first decade. Only about 900 acres of uneven-aged management are used as a primary silvicultural system on the Forest, limited to campgrounds and other intensively used recreation facilities.

This alternative is third (between I and C-Modified) in terms of amount of large material available. Much of the large material would be from old growth areas, which in this alternative are managed on a rotating basis with long rotations. There is no emphasis on large material in this alternative.

Alternative C-Modified

Alternative C-Modified allocates 471.4 thousand acres of lands to some level of timber production (smallest acreage of all alternatives). Intensity of timber management activities varies as follows:

0 acres	- Full Yield
471,400 acres	- 50 to 99 percent of Full Yield
0 acres	- 1 to 49 percent of Full Yield

Alternative C-Modified provides a timber harvest (ASQ) of 15.6 million cubic feet per year, equivalent to the long term sustained yield for this alternative. About 65 million board feet of ponderosa pine is provided during the first decade. Extensive use of uneven-aged management across the Forest is provided on about 96,400 acres during the first decade; cutting cycles vary significantly in order to provide large diameter trees in most visual corridors and other recreation use areas.

This alternative is next to last in terms of total large material produced. This is due mostly to the low total harvest level.

The expected harvest volume in the fifth decade by size class and alternative is shown in Table 4-29. This is also a close approximation of sizes to expect after the fifth decade and illustrates estimates of future availability of quality wood (greater than 18 inches in diameter).

Indirect Effects

Future Timber Stand Structure, Species Composition, and Size Class Diversity

The rate at which timber is harvested (particularly mature and overmature timber), plus the level of

TABLE 4-29
EXPECTED HARVEST VOLUME BY SIZE CLASS BY ALTERNATIVE
(MMCF)

	Alternative					
SIZE CLASS (DBH)	NC	B MOD	E-DEP	I Preferred	A	C MOD
7-17	N/A	117	90	93	112	84
18-23	N/A	74	56	64	63	48
24 +	N/A	28	15	33	18	24
TOTAL		219	160	190	193	156

MMCF - Million Cubic Feet

management intensity, has significant effects on future stand structure, distribution of size/age classes, species composition, productivity, and ultimately future harvest levels on the Ochoco National Forest. In those areas of the Forest allocated for long term production of timber, it is an objective to establish a "regulated forest" in which there are reasonable assurances of a "sustained yield" of timber products over the long term. Economic and administrative reasons are the basis for this objective; as long as the forest is well protected and cared for, it makes little difference biologically whether or not it is in a regulated condition (Davis, 1966). But both overcutting and undercutting of timber under a planned regulatory condition can create future deficits of both size and volume because such cutting controls the rate of new stand formation through regeneration. A regulated forest can be maintained with either even- or uneven-aged management (or a mix of the two).

The "regulated" Ochoco National Forest of the future will contain a variety of size classes and species of timber. Modeling techniques are not currently available to portray an accurate description of the forest by alternative, but estimates of future successional stages (found in Table 2-8, Chapter 2) provide some insight into the future forest. As can be seen, both young age classes (Stage I and II) and old growth age classes (Stage VI) will comprise the lowest percentage of total forested acres in future decades for all alternatives (except No Change for which data is unavailable). Stages III through V reflect timber stands in which sites are fully occupied and timber stands are growing at near maximum rates (assuming proper stand management). These stages comprise the largest percentage of total growing stock for all alternatives in future decades. Alternatives B-Modified, I and C-Modified may exhibit higher levels of diversity of stand structure due to a mix of both even- and uneven-aged management, but may also have higher percentages of white fir and Douglas-fir in younger age classes and growing stock due to successional pressure afforded through uneven-aged management. Alternatives E-Departure and A will probably exhibit lower levels of structural diversity due to even-aged management and associated harvest levels, but species composition of even-aged, younger stands (and future growing stock) will be primarily early successional species such as ponderosa pine, western larch and lodgepole pine.

Indirect Effects on Other Environmental Components

The volume of timber harvested today has significant effects on the economic structure and social fabric of the local community. Timber provides jobs both directly (through local timber manufacturing) and indirectly (through secondary support industries and services). These effects are also cumulative in that timber produced on the Forest is used in other communities within an area referred to as the "Extended Area Of Influence." Future timber supplies will affect the ability of primary manufacturers of timber products to compete in a market plagued with uncertainties, as well as the ability of local communities to finance local school and transportation systems. See Effects on Social and Economic, this chapter for analysis of timber harvest and other Forest resources on local communities.

Timber harvest affects almost all other environmental components existing on the Forest, some positively and some negatively. Timber harvest reduces old growth as a unique and dwindling resource on the Forest and in the nation as a whole. Timber harvest also changes (but not necessarily reduces) "biological diversity" of both plants and animals existing on the Forest. Effects on these two environmental components (old growth and biological diversity) can be cumulative; effects are discussed in detail in the relevant sections of this chapter (see Effects on Old Growth and Biological Diversity).

Also see Effects on Soils, Water, Wildlife and Fish, Scenic Resources, Recreation, Air Quality, Cultural Resources, Forest Health, and Forest Residues.

Cumulative Effects

Cumulative effects of timber harvest on other environmental components are discussed under those relevant headings mentioned above (under indirect effects). In summary, the cumulative effects of the alternatives on timber relate primarily to social and economic issues and are discussed in detail under

Social and Economic Effects, this chapter. The cumulative effects on timber per se are reflected in projections of productivity and composition of future stands, which has been captured in calculations of current and future volume available for harvest (i.e. long term sustained yield and ASQ). It is assumed that application of proper silvicultural systems, including specific cultural treatments such as thinning and planting with genetically improved seedlings will increase future productivity of forest stands, and credit for this future productivity (Earned Harvest Effect [EHE]) is incorporated into harvest calculations for the various alternatives (see Appendix B, Description of the Analysis Process). Table 4-16 displays approximate adjustments to annual timber sale program quantities due to earned harvest effects for the various alternatives. It is presented in millions of board feet (rather than cubic feet) for clearer understanding by local concerned publics. These values have already been incorporated into ASQ and Timber Sale Program Quantity outputs displayed in Table 2-8, Chapter 2. Also see Socio-Economic Cumulative Effects, this chapter.

TABLE 4-30
EARNED HARVEST EFFECT
(Million Board Feet)

NC	B-MOD	E-DEP	I	A	C-MOD
34	10	4	3	7	1

Mitigation Measures

Additional intensive timber management practices that result in future increases in productivity may be initiated during plan implementation, depending on staffing and budget levels on the Forest. Adjustments to the allowable sale quantity (ASQ) can be made as added earned harvest effects (Regional Policy 36 RF 219.13) as these practices are completed for some of the alternatives. These would be in addition to the earned harvest effect already incorporated into the alternatives, as discussed in Cumulative Effects, above. Table 4-31 displays approximate added earned harvest effects potentially available for each of the alternatives (in million board feet).

TABLE 4-31
ADDITIONAL EARNED HARVEST EFFECT
(Million Board Feet)

NC	B-MOD	E-DEP	I	A	C-MOD
6	0*	**	3	0	1

* Alternatives B MOD and A already include all potential earned harvest effects

** Earned harvest effect would vary each decade in order to reduce the decline of harvest over time (resulting from departure status)

Long-term management of timber stands which have an objective of maintaining high levels of wood production require careful scheduling and monitoring of silvicultural treatments, especially on "poor" sites, where delays of activities (such as precommercial and commercial thinning) may predispose stands to attacks by forest insects and disease. Fluctuations in forest staffing levels inhibit the agency (at times) from efficiently managing timber stands. All of the alternatives assume that some base level of organization is available to prepare and administer silvicultural activities. Increased budgets for monitoring and preparation of these activities have potential for increasing future productivity of timber stands, and therefore the supply of available timber for possible harvest.

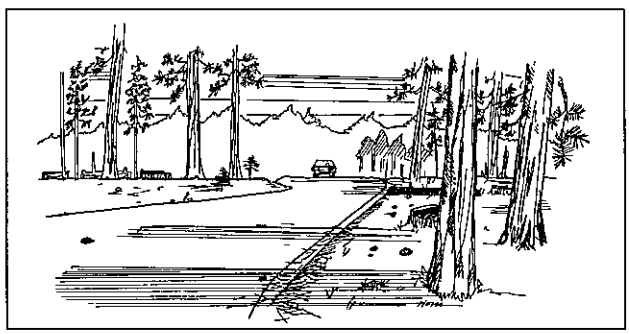
Production of quality wood from second growth stands of timber will require skills and knowledge not yet fully available. The Ochoco National Forest has entered into administrative studies and has requested assistance from the Pacific Northwest Research Station to provide research on production of quality wood from ponderosa pine. This has substantial potential for mitigating the loss of future supplies of high quality wood for local manufacturing facilities. Standards and guidelines (Appendix D) have been developed to emphasize conservation

and production of quality ponderosa pine during timber sale preparation activities. Marking guides are to provide instructions for retention of high quality timber (when conditions are biologically suited), especially in uneven-aged management prescriptions. Allowances have been made for pruning, where it can be shown to be efficient and cost effective to do so. If pruning is done on a large scale, it should provide about the same percent of the volume in grade 3 or better as is provided today, about 15 percent. But the Forest will not provide the large 36-inch and greater fine grained material as is currently produced. If pruning is not done, it is estimated that less than five percent of the volume would be in grades 3 or better.

Conflicts with Other Plans and Policies

Alternatives I (Preferred), B-Modified, A and E-Departure will all meet the Oregon Department of Forestry timber goals for the Ochoco National Forest (see Conflicts with Other Federal, Regional, State and Local Plans, Including Indian Reservation Plans, this chapter).

Transportation



Effects on the transportation system from the implementation of land management alternatives are described in this chapter. A multitude of direct, indirect, and cumulative effects on various resources are associated with roads; these are discussed at length under respective environmental components in this chapter. Once constructed, the road system itself becomes a resource that alternative implementation affects. Significant interactions and their associated effects in this discussion are limited to those that affect the road system itself and its management.

The assumptions important to the following discussion are:

-The greatest potential for public use of roads would exist in the alternatives with the greatest mileage in the completed system. However, the mileage varies depending on the extent to which roads are closed or are not available for use by passenger cars due to design and maintenance levels.

-Road management objectives identify the need to close roads, and allow maximum public use of the road system consistent with resource protection, safety, and budgetary constraints.

-Arterial roads provide access to large areas and comprise the basic access network. Collector roads serve smaller areas and are usually connected to arterial roads. Local roads provide access to site specific areas and are constructed to serve a dominant use or resource.

Direct Effects

The activities that most affect the transportation system are road construction and road closure.

Road Construction

The majority of the arterial and collector road system is already established. Further construction of arterial or collector roads would be to provide access to unroaded areas, or to upgrade existing local roads to provide a safer and more efficient transportation system. The amount of arterial or collector road construction ranges from four miles under Alternatives E-Departure and C-Modified to 14 miles under Alternative B-Modified in the first decade.

Construction of additional local roads will account for the majority of the road construction. These roads are lower standard and intended for use by high clearance vehicles. They are primarily constructed to facilitate timber harvest. Some local roads which are unsafe, are causing resource damage due to poor location, or are poorly suited to current logging methods, will be replaced. All alternatives require new local road construction. The amount of

the construction reflects the number of acres harvested. Initial entry into an area for timber harvest generates the most local road construction.

Management of big game and other wildlife habitat affects the timing of road construction by affecting the scheduling and distribution of timber harvest. Delayed harvest of forest stands managed on long rotations to provide big game cover delay local road construction as well.

Road Management

Road closures on the Forest are yearlong or seasonal. Closures and restrictions are used to protect resources (soil and water), the investment, and safety of expected users. Closures would increase over the planning period for all alternatives. Seasonal closures are employed to maintain or improve habitat for big game. The number of closures in this category is directly related to the acreage allocated to big game management.

The Ochoco National Forest has a road closure program called the Green Dot System. This system is a result of a joint agreement with the Oregon State Department of Fish and Wildlife and the U.S.D.A. Forest Service under which National Forest roads may be closed in designated areas during big game hunting season. The purpose of the program is to enhance escape habitat and to improve hunt quality. A reflective green dot on a signpost is being used to identify open roads for hunters. Areas closed under this program are assumed to continue for all alternatives.

Effects by Alternatives

New system mileage and total miles needed for all alternatives are displayed in Table 4-32.

All alternatives show a substantial decrease in the annual rate of construction after the third decade, reflecting the decrease in first-entry harvest acres. The miles of roads open to passenger cars and high clearance vehicles by alternative is displayed in Table 2-8 in Chapter 2 The following alternative discussions do not include short-term road closures due to implementation of the Green Dot System.

Alternative B-Modified

During the first decade, approximately 246 miles will be added to the system. Ultimately, 931 miles will be constructed through the fifth decade. This amounts to 83 percent (1,122 miles) of the long-

TABLE 4-32
MILES OF ROAD TO BE CONSTRUCTED
(Decades 1-5)

	ALTERNATIVE					
	NC	B-MOD	E-DEP	I Preferred	A	C-MOD
Arterial/Collector All Areas	20	33	4	14	20	4
Local Roaded Areas Unroaded Areas	555 152	780 309	614 152	683 227	555 244	765 152
New System Total	819	1122	770	924	819	921
Total Miles	5373	5676	5324	5478	5373	5475

The total mileage figures are for the completed system which occurs beyond the fifth decade The total includes existing road mileage needed for management and approximate reductions due to the obliteration of unsafe or unneeded local roads

term road construction needs. During the first decade, approximately 904 miles of road reconstruction will be required to serve user needs and resource management objectives.

During the first decade, there will be approximately 413 additional miles of seasonal and permanent road closures (see Chapter 3). Ultimately, through the fifth decade, 1,623 additional miles over the present time will be closed.

Alternative E-Departure

During the first decade, approximately 222 miles will be added to the system. Ultimately, 699 miles will be constructed through the fifth decade. This amounts to 91 percent (770 miles) of the long-term road construction needs. During the first decade, approximately 887 miles of road reconstruction will be required to serve user needs and resource management objectives.

During the first decade, there will be approximately 390 additional miles of seasonal and permanent road closures. Ultimately, through the fifth decade, 1,582 additional miles over the present will be closed (see Chapter 3).

Alternative I (Preferred)

During the first decade, approximately 179 miles will be added to the system. Ultimately, 750 miles will be constructed through the fifth decade. This amounts to 81 percent (924 miles) of the long-term road construction needs. During the first decade, approximately 878 miles of road reconstruction will be required to serve user needs and resource management objectives (see Chapter 3).

During the first decade, there will be approximately 1,058 additional miles of seasonal and permanent road closures. Ultimately, through the fifth decade, 1,685 additional miles over the present will be closed.

Alternative A and Alternative No Change

During the first decade, approximately 220 miles will be added to the system. Ultimately, 772 miles will be constructed through the fifth decade. This amounts to 94 percent (819 miles) of the long-term road construction needs. During the first decade, approximately 790 miles of road reconstruction will be required to serve user needs and resource management objectives.

During the first decade, there will be approximately 194 additional miles of seasonal and permanent road closures. Ultimately, through the fifth decade, 1,234 additional miles over the present will be closed (see Chapter 3).

Alternative C-Modified

During the first decade, approximately 189 miles will be added to the system. Ultimately, 633 miles will be constructed through the fifth decade. This amounts to 69 percent of the long-term (921 miles) road construction needs. During the first decade, approximately 887 miles of road reconstruction will be required to serve user needs and resource management objectives.

During the first decade, there will be approximately 1,020 additional miles of seasonal and permanent road closures. Ultimately, through the fifth decade, 2,724 additional miles over the present will be closed (see Chapter 3).

Indirect Effects

For all alternatives, the indirect effects are primarily those related to road maintenance. While these effects are essentially the same by alternative, they vary by the amount of construction, reconstruction, and the total system at the specific point in time. All system roads will be maintained to at least the basic custodial care required to maintain drainage, protect the road investment, and minimize damage to adjacent land and resources. This level is the normal prescription for roads that are closed to traffic. Higher levels of maintenance may be chosen to reflect greater use or for resource protection.

Roads normally deteriorate due to use and weather impacts. Livestock may cause damage to road cut and fill slopes Timber management practices such as clearcutting increase water runoff, the increased runoff can result in the need for more extensive road drainage systems. This deterioration can be reduced through adequate maintenance or restriction of use. All alternatives have land allocations which attract vehicle use on existing roads, resulting in the need for recurring maintenance.

When excessive traffic wear resulting from deferred maintenance or storm damage has occurred, reconstruction may be required to provide a suitable facility.

User safety is an additional indirect effect. Regardless of maintenance levels, safety can be jeopardized by the volume and mix of traffic on certain roads.

Cumulative Effects

No significant adverse cumulative effects are expected to occur to the transportation system. Forest-wide standards and guidelines (Appendix D), as they apply to location, design, operation, and maintenance of the transportation system, assure that the road system will accommodate its intended use over time.

Cumulative effects of the transportation system on other resources (indirect), such as water, wildlife and soil, are possible and are discussed in detail under those respective headings of this chapter.

Mitigation Measures

The construction, reconstruction, maintenance, and management of Forest roads utilize many mitigation measures that derive from engineering requirements Cost of mitigation measures to improve open roads for public use and measures necessary for resource protection are incorporated in all alternatives. The following activities are some of the measures taken to mitigate impacts:

- Outsloping road surfaces and adding culverts on ditched roads to keep water from concentrating.

- Rocking waterbars and drain dips to reduce erosion where water leaves the road.

- Diverting water onto undisturbed ground where sediment can be filtered out.

- Adding riprap at culvert outlets to stop erosion.

- Surfacing road travelways to reduce rutting and permit their use for log and firewood hauling when wet.

- Seeding cut and fill slopes, waste areas, debris burial sites, and unsurfaced roads to reduce erosion.

- Draining spring areas adjacent to roads to protect investment and accommodate permitted uses.

- Minimizing undercutting of cut slopes during ditch cleaning operations to reduce exposing bare soil.

- Reducing overall width of roads by designing travelways, turnouts and curve widening for only the projected use.

- Obliterating local roads no longer needed for management purposes and returning the land to productivity. Obliteration will temporarily increase soil movement but benefit soil and water resources by reducing erosion and sedimentation over the long term.

- Removing culverts likely to be blocked during periods of long-term nonuse (yearlong closures) to mitigate soil and water impacts and investment loss. A short-term consequence on the water quality will occur when replacing the culverts during later entries.

The cost of many of these measures increases as roading and timber harvest occur on steep slopes and sensitive soils.

Prohibiting noncommercial traffic on weekdays and commercial traffic on weekends, gating and signing during commercial operations and rescheduling some outputs to other areas to minimize traffic are examples of traffic management techniques which can be effectively used to mitigate safety conflicts between commercial and recreational uses and eliminate the need for reconstruction.

Restrictions on use of the Forest's road system can have a strong influence on the public's perception of the Forest's management. Increasing public understanding of the selected road management strategy will increase acceptance and avert potential conflicts. Information may be posted on signs in the Forest and/or on visitor maps.

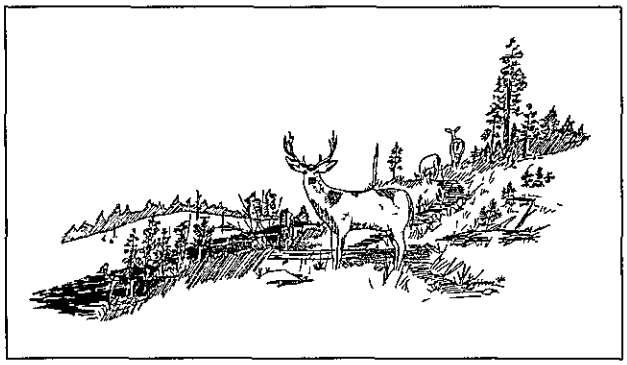
Additional mitigation measures can be found in Appendix D, this FEIS.

Conflicts with Other Plans and Policies

No conflict is seen with other plans and policies regarding the transportation system. The Forest cooperates with State, County and other Federal agencies in meeting transportation objectives. Rights-of-way and easements across Forest land for roads are granted to individuals, companies, and government agencies, subject to need and environmental restrictions.

The Forest may also negotiate with the counties to acquire jurisdiction on county roads where the proportion of Forest Service-related traffic is high. The jurisdiction will allow the Forest Service to have full responsibility for traffic operations and maintenance.

Unroaded Areas



This section discusses the effects on those unroaded areas inventoried for potential wilderness during the Congressionally mandated Roadless Area Reviews and Evaluations (RARE I and RARE II). The Oregon Wilderness Act of 1984 considered these same inventoried areas, designating three areas Wilderness, one area as "further study" and released the remaining areas for management to be determined by the Forest Plan. The effects of different management strategies on each of the unroaded areas vary by alternatives, with the exception of the Broadway area in which vegetative manipulation has occurred. Further analysis of the unroaded areas does not include the Broadway area. Those alternatives aimed at vegetative manipulation and roading eliminate future management as unroaded areas, and forgo future options of these areas being designated as Wilderness. Those alternatives that maintain undeveloped conditions provide options for evaluating Wilderness values in future planning efforts.

Direct Effects

A detailed description and analysis of the effects of the alternatives on individual unroaded areas is contained in Appendix C, Roadless Area Evaluation.

Table 4-33 displays the different management strategies for each unroaded area by alternative. Seven options are considered for the future management of the six unroaded areas.

1. SPNM -Maintain the area's unroaded character for semiprimitive, nonmotorized recreation.
2. SPM -Maintain the area's unroaded character for semiprimitive, motorized recreation.
3. W -Recommend the area, or portion thereof, for inclusion in the wilderness system.
4. BG -Manage the area to meet big-game habitat objectives. This would include some timber harvest and related road construction to create proper cover/forage ratios and improve the habitat for big game species.
5. G/F -Develop the area for timber/forage production and construct the transportation system that will facilitate the area's future management.
6. RNA -Protect the area for research purposes as a Research Natural Area.
7. WS -Manage the area consistent with Wild and Scenic River designation.

TABLE 4-33
ROADLESS AREA DESIGNATION BY MANAGEMENT PRESCRIPTION AND ACRES

	ALTERNATIVES					
Inventoried Areas	NC	B-MOD	E-DEP	I Preferred	A	C-MOD
Cottonwood Total Roadless Criteria Acres - 9,777	BG-9,777	G/F-9,777	2/ SPNM-9,737 BG-40	3/ SPNM-6,592 G/F-3,185	BG-9,777	2/ SPNM-9,737 BG-40
Rock Creek Total Roadless Criteria Acres - 11,414	BG-11,414	G/F-11,414	2/ SPNM-9,336 BG-2,078	3/ SPNM 6,198 G/F-5,216	BG-11,414	2/ SPNM-9,336 BG-2,078
Silver Creek Total Roadless Criteria Acres - 7,459	1/ SPNM-2,510 G/F-4,949	SPNM-3,110 G/F-3,504 RNA-845	2/ SPNM-3,226 BG-3,388 RNA-845	SPNM-3,110 G/F-3,504 RNA-845	1/ SPNM-2,510 G/F-4,949	2/ SPNM-3,226 BG-3,388 RNA-845
Lookout Mountain Total Roadless Criteria Acres - 14,273	1/ SPNM-16,577	SPNM-7,550 G/F-8,110	2/ SPNM-2,950 G/F-12,713	SPNM-15,660	1/ SPNM-16,577	2/ SPNM-15,660
Green Mountain Total Roadless Criteria Acres - 6,630	2/ BG-7,000	2/ G/F-7,000	2/ SPM-7,000	2/ G/F-7,000	2/ BG-7,000	2/ SPNM-7,000
Deschutes Canyon- Steelhead Falls Total Roadless - 10,000 Criteria Acres	SPNM-10,000	SPNM-700 G/F-9,300	BG-7,500 W-2,500	SPNM5,138 BG-4,212 WS-650	SPNM-10,000	W10,000

1/ Original designation under current Ochoco National Forest and Crooked River National Grassland Plans

2/ Manageable boundary acres for SPM and SPNM

3/ Includes area to be managed under retention visual quality objective

TABLE 4-34
UNROADED ACRES BY ALTERNATIVE

Resource/Activity/Effect	Units of Measure	NC	B MOD	E DEP	I Preferred	A	C MOD
(Roadless Criteria Acres) Acres Remaining Unroaded	M Acres						
Decade 1		29 1	15 8	38 2	35 7	29 1	56 5
2		29 1	15 8	38 2	27 6	29 1	56 5
5		29 1	15 8	38 2	27 6	29 1	56 5

Direct Effects Common to All Alternatives

The major direct effect of developmental activities in unroaded areas is the reduction of the total area available for unroaded activities. Another consequence of management activities is the reduction of a particular quality associated with a specific unroaded area Most of the unroaded areas on the Ochoco National Forest have common characteristics; they provide semiprimitive motorized and nonmotorized recreation experiences, add to the overall scenic quality of the Forest, and provide relatively large areas of secure habitat for many wildlife species. Vegetation and plant community types are similar. The exception to this is Deschutes Canyon, which is located at lower elevations in the high desert, and contains large areas of grass and shrub dominated plant communities.

Alternative A and Alternative No Change

Timber harvest roads and other vegetative manipulation activities would reduce the unroaded acreage to 28,450 acres. Lookout Mountain, Deschutes Canyon, and a portion of Silver Creek would be managed under an unroaded prescription. The qualities associated with Cottonwood, Rock Creek, and Green Mountain would be reduced or eliminated as they would be developed and managed for big game production; entry and development into these areas will likely occur in the first and second decade. Individuals desiring a semiprimitive, nonmotorized recreation experience would use the remaining unroaded areas or wilderness areas on or outside the Forest.

Alternative B-Modified

The lower 8,110 acres of Lookout Mountain, all of Cottonwood, Rock Creek, Green Mountain and half of Silver Creek would be allocated to a timber/forage emphasis; development for these purposes would occur at a rapid rate, probably within the first decade. A portion of Deschutes Canyon, Silver Creek, and the upper 7,550 acres of Lookout Mountain will remain unroaded, a total of 15,750 acres.

Alternative C-Modified

This alternative would maintain a relatively large acreage (46,500 acres) in an unroaded, semiprimitive condition. In addition, Deschutes Canyon/Steelhead Falls Wilderness Study Area (9,350 acres) would be recommended as wilderness. The remaining portions of Cottonwood (40 acres), Rock Creek (2,080 acres), and Silver Creek (3,390 acres) would be developed and managed with a big game emphasis. Development of these areas would begin immediately upon selection of a preferred alternative and approval of the Plan. This alternative would have very little negative impact on individuals currently using the existing unroaded areas.

Alternatives E-Departure

This alternative would reduce the total Forest unroaded area by 24,800 acres. Cottonwood, most of Rock Creek, a portion of Silver Creek, and a small portion of Lookout Mountain would be retained as unroaded with a semiprimitive, nonmotorized emphasis, for a total of 27,315 acres. In addition, 2,500 acres of Deschutes Canyon would be recommended for wilderness. A portion of Silver Creek (845 acres) would be managed as a Research Natural Area; the Green Mountain area (7,000 acres) would be managed for semiprimitive, motorized recreation. Very little displacement of users would occur as a result of this alternative because the qualities of each unroaded area are retained in a semiprimitive condition. Lookout Mountain would be most affected because it is becoming increasingly popular for primitive hunting experiences, hiking, horseback riding, cross-country skiing, snowmobiling, and mountain biking. Areas allocated for purposes of development would probably be entered in the first decade.

Alternative I (Preferred)

This alternative would retain 7,550 of Lookout Mountain, 3,110 acres of Silver Creek, and 11,820 acres of Rock Creek/Cottonwood Creek as unroaded. In addition, 5,140 acres of the Deschutes Canyon/Steelhead Fall Wilderness Study Area would be allocated to Squaw Creek, a 7,840 acre Squaw Creek Management Area for SPNM recreation opportunities. A total of 35,460 acres would be maintained as unroaded. The lower Rock Creek/Cottonwood areas

would be affected by helicopter logging. The effects of harvest preclude this area from semiprimitive recreation opportunities; timber harvest would dominate the landscape. Portions of the upper Rock Creek/Cottonwood Creek Area (56,250 acres) would be harvested by conventional methods. Roads would be constructed; skyline and tractor skidding would dominate the landscape. These areas would not be available for unroaded recreation and this precludes future options for wilderness designation. The potential to disturb sensitive soils and have negative impacts on the anadromous fisheries of Rock Creek/Cottonwood Creek would be increased. Development in these areas would probably occur during the first decade.

In summary, Table 4-34 displays the total acres remaining unroaded at the end of the first, second and fifth decades. It can be assumed that entry into all of the areas reallocated to development will occur at a relatively rapid rate, probably during the first decade. The exception to this is Lookout Mountain (Alternative I only); any development to the lower section will occur at a slower rate conducive to management area objectives, in cooperation with major user groups and in coordination with the Pacific Northwest Experiment Station.

Indirect Effects

The effect of maintaining unroaded areas restricts activities such as road building, timber harvest, and summer motorized recreation. Without vegetative manipulation, including timber harvest, these areas would eventually reach climax successional conditions. Natural fuels will build up increasing the risk and severity of fires. The unmanaged timber stands will not have the vigor of managed stands, increasing susceptibility to insects and disease. Even though mining activities are not excluded from unroaded areas, the location and development of the minerals resource is hindered by lack of access and the added expense of special operation requirements The indirect effect on the economy is discussed in the Recreation section of this chapter. Alternative C-Modified, which maintains the most unroaded areas, would affect these activities the most; Alternative B-Modified would open the majority of the unroaded areas to development and have the least effect.

Alternatively, retention of unroaded areas has a positive effect on maintaining the old growth habitat for a variety of wildlife species, protecting watershed and soils resources, and providing natural scenery. These unroaded areas provide for security of big game as well as challenging hunting and viewing opportunities. Trophy game animals are associated with these areas. Alternatives C-Modified and I provide the greatest positive effect on these resources.

Cumulative Effects

Each time an unroaded area is developed on the Ochoco National Forest there is a cumulative impact, this action contributes to an overall reduction in unroaded acres from the local, regional or national perspective. It not only affects unroaded areas in terms of the amount of semiprimitive environment available, but also affects wilderness and unroaded use throughout the region. These effects result in shifts in either current or future demand for this resource to alternate areas that may create crowding. Even though unroaded and wilderness areas may provide two different kinds of experience for users, there is a common denominator; the environment is in a natural state, unaltered by human activities. Future options also remain open when unroaded areas remain unroaded.

Cumulatively, the reductions in unroaded areas would be greatest in Alternative B-Modified, followed by Alternatives No Change, A, E-Departure, I and C-Modified.

Mitigation Measures

Trail system management in remaining unroaded areas can increase the total carrying capacity by redistributing visitor use. This increase in use is brought about by opening areas that were not previously accessible. This measure has only limited value; eventually the total carrying capacity can be exceeded

Limited unscheduled timber harvest is planned in the lower portions of Lookout Mountain to improve timber stand conditions for recreational purposes. The low-standard roads that may be needed to complete these projects will be closed to summer motorized use and can be narrowed to provide access for horseback riding, hiking, and mountain biking.

Fire implementation plans and projects may be developed to lessen the potential wildfire effects, while creating some diversity within the areas.

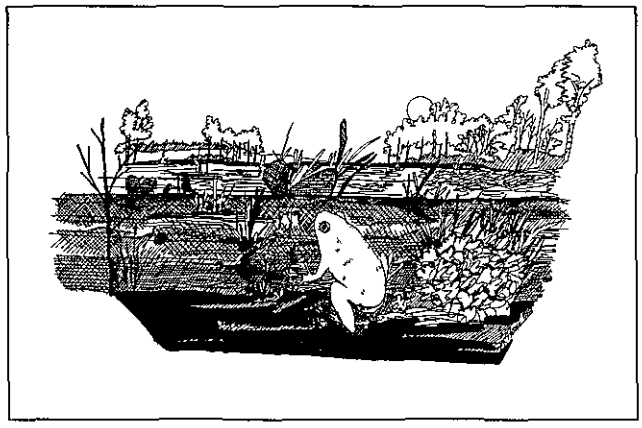
Access for mining will be limited to that necessary for the current stage of development. It will be designed to fit into the land with as little impact as possible to the unroaded character of the area. Mining activity must be justified by an economic analysis based on potential quality and quantity of the material being mined.

The only mitigation for the loss of unroaded areas is not to schedule roads or timber harvest in those areas. Alternative I mitigates development within the Rock Creek/Cottonwood areas by maintaining some of the area as unroaded and by utilizing helicopter logging. Trail systems developed through these areas will need to be protected and possibly relocated to offer viable recreation opportunities into the remaining unroaded areas.

Conflicts with Other Plans and Policies

The Jefferson County Comprehensive Plan does not support the creation of additional Wilderness within the bounds of Jefferson County. Consequently, a conflict occurs with Alternatives C-Modified and E-Departure, which allow for wilderness recommendation for all or portions of the Deschutes Canyon/ Steelhead Falls Area. No other conflicts arise with any of the proposed management strategies for the unroaded areas of the Ochoco National Forest.

Water



This section includes Riparian Areas, Wetlands and Floodplains.

The condition of riparian areas, wetlands and floodplains on the Forest reflects in large measure the condition of the whole watershed where they exist, from Class IV tributary headwaters to Class I main drainages. Water quality, quantity, and timing of runoff in this system are the product of the interaction of soils, vegetation, climate and management activities that affect each watershed Nowhere within a watershed are management activities and the water resource more closely related than in riparian areas.

Direct Effects

Timber management, the transportation system, livestock grazing, and fire may all result in significant consequences to the water resource.

Water Quality

Timber

Timber management activities, including timber harvest, slash treatments, and site preparation, affect the water resource through the alteration or destruction of vegetation, the compaction or disturbance of mineral soil (see Effects on Soils, this chapter), and changes in sediment yield and tem-

perature (Fredriksen and Harr, 1979, Hewlett and Doss, 1984). The potential for impact becomes greater on steeper slopes or on more erosive soils Removal of streamside vegetation has a direct effect on water temperature with potential for increased temperatures during summer months (Brown and Krygier, 1967), and for lower temperatures in winter. Increased ice formation can result in stream bank damage (Chamberlin, 1982; Swanson, 1980). Increased water temperatures also reduce the amount of oxygen that can be dissolved in water (Ruttner, 1963). At higher temperatures the more rapid decomposition of organic debris (needles, leaves, branches) in streams may reduce dissolved oxygen below critical levels for fish (Berry, 1975). Higher stream temperatures in combination with increased availability of nutrients and sunlight are often responsible for the formation of nuisance blooms of algae (Likens, et al, 1970). Within currently degraded stream reaches on the Forest, water temperatures will often exceed 80 degrees F. on warm sunny days.

Alternative No Change has the greatest overall effect on vegetation and soil in the first decade (see Table 2-8, Chapter 2). However, over the course of the first five decades, Alternative B-Modified treats 13 percent (100,000 acres) more than any other alternative. Alternative E-Departure treats the fewest acres over the same period of time. Alternative I treats the fewest acres in the first decade, but over five decades its effects are very similar to Alternatives No Change, A and C-Modified.

Transportation System

Although road effects are difficult to separate from timber harvest effects, it is generally agreed that roads account for the majority of severe sediment problems and are often the links between sediment source areas (skid trails, landings, cutslopes) and stream channels (Harr, 1976; Houpt, 1959; Kidd and Megahan, 1972, Ric, 1979; Stone, 1973). Roads paralleling streams may reduce shade on some sites by as much as 43 percent (Thomas, 1979; Skeesick and Steward 1981).

Roads constructed adjacent to streams produce up to twice the amount of sediment as that from midslope or ridge top roads (Anderson, 1974; Wooldridge, 1980). Substandard roads left open after logging for recreation or other use can become chronic sources of erosion and sediment (Anderson, et al. 1976). Maintenance operations themselves (clearing ditches, reshaping cutslopes, regrading road surfaces) can prolong recovery and significantly increase erosion and sedimentation (Bullard, 1963).

The major portion of the transportation system on the Forest has been completed. Approximately 5,000 miles of road have been constructed (See Chapter 3, Affected Environment). Many roads built decades ago paralleled drainages, severely degrading the character of riparian areas through compaction of soils and elimination of a large portion of the narrow band of riparian vegetation. The proposed alternatives vary by only 1.4 percent in the total miles of open and maintained roads in the first decade. By the 5th decade, the maximum difference is only six percent. Although the differences between alternatives are small, the overall impact of the road system, especially the indirect and cumulative effects of sediment and runoff, are extensive.

Livestock Grazing

Removal of vegetation and compaction (especially of moist riparian soils) by grazing animals can reduce infiltration and increase the potential for overland flow. These impacts on the riparian area can in turn lead to changes in sedimentation, peak flows, and channel morphology (Anderson et al, 1976; Blackburn, 1983; Gebheardt and Johnson, 1981; Lusby, 1970; Platts, 1981; Willott and Pullar, 1984).

Forage use by grazing animals can be 25 to 60 percent higher on streambanks in riparian areas than on adjoining uplands (Nelson and Platts 1985). This concentrated use can lead to compaction in the surface one to two inches of soil, especially in moist riparian areas (Alderfer and Robinson, 1947). Removal of streamside vegetation through overgrazing has a direct effect on stream temperature, especially on sites where coniferous shade is lacking

or is insufficient and where grasses and shrubs provide a large proportion of the effective shade. Livestock use does not vary significantly among the alternatives (Table 2-8, Chapter 2). However, new, more stringent forage utilization standards combined with structural improvements designed to draw livestock away from riparian areas should help to reduce grazing impacts in all alternatives (see Mitigation Measures, this section).

Impacts to the chemical quality of water are quite variable and difficult to monitor, but increases in organic matter and bacteria occur as a result of grazing (Francis and Schepers, 1982; Skinner, et al, 1974).

Fire

Wildfire effects on water quality come about primarily through increased sedimentation and mass soil movement following the destruction of vegetation and exposure of mineral soil to increased runoff (Helvey, 1980). The flushing of ash deposits into streams may alter the concentration of some chemical elements, but this effect on water quality is not well understood (Swanson, 1980). In addition, the loss of vegetation in riparian areas exposes the water surface to increased solar radiation which directly affects water temperature (Helvey, et al, 1976).

The negative effects of wildfire on water quality may be increased as a result of measures taken to bring a fire under control (Barney and Steels, 1983), or through salvage operations following a major fire (Bottom et al, 1985, Cornish and Mackay, 1982).

Wilderness, unroaded areas, Research Natural Areas and old growth units tend toward long term stable vegetation. In this environment, erosion and sedimentation could be expected to remain at low levels and water quality would be high. However, such areas would not be immune to disturbance by wildfire, insect attack or other natural disasters (Anderson, et al, 1976). Such catastrophic events may result in a one time major impact to water quality.

Prescribed burning has the potential to affect riparian areas and the water resource directly through the destruction of vegetation and changes in the character of some soils causing them to become water repellent or hydrophobic. Wildfires, although they have potential for great impact, are not a planned event and their effects are difficult to predict. The amount of prescribed burning planned to treat both natural fuels and activity fuels does not vary significantly among any of the alternatives.

Other Direct Effects

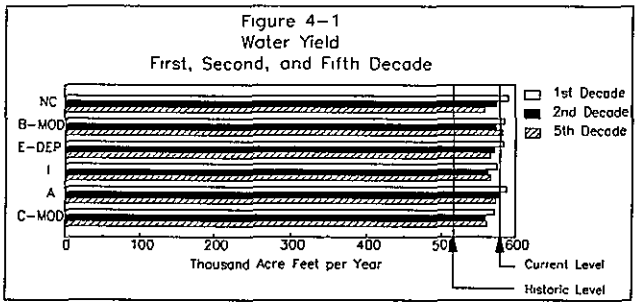
Mining activities can affect water quality by exposing spoils piles to erosion, thereby increasing the potential for sedimentation, or through the leaching of chemicals to a stream course from spoils piles or treatment processes.

Off-road vehicle (ORV) use has the potential to affect water quality primarily through the destruction of vegetation, and compaction and rutting of road surfaces. The ultimate impact on water quality is determined by such factors as season and amount of use, soil type, terrain, vegetation and the likelihood of sediment from areas reaching a watercourse (Payne et al, 1983, Sparrow and others 1978; Webb et al, 1978).

Alternatives B-Modified, I and C-Modified propose the construction of 190 miles of all terrain vehicle (ATV) trails in the first two decades.

Water Quantity and Runoff Timing

Figure 4-1 displays the effect of the various alternatives on the potential annual volume of runoff leaving the Forest for decades one, three, and five. The range is two percent above to 3.5 percent below the existing level of runoff based on a current annual harvest. This range may be exceeded on a localized basis in individual watersheds. Optimum distribution of harvest among all watersheds should serve to mitigate this potential problem (see cumulative effects discussion).



Currently there is some debate over the effects of runoff (both annual and peak flow), and the role played by sediment delivery in determining channel stability (Galbraith 1973, Megahan 1979, Rice 1980). Recent research has focused on the potential of rain-on-snow events in causing increased channel damaging peak flows (Harr 1975). Since at the present time there is no quantified relationship between annual runoff and peak flows, Figure 4-1 should be looked on as a relative indicator of potential changes in peak flow and a source of energy available to more sediment from disturbed areas into stream channels. Increases above the existing level of annual runoff could be expected to decrease stability on marginally stable stream channels, while decreases in runoff could be expected to have the opposite effect (Alternatives I and C-Modified).

Openings in the Forest accumulate more snow than contiguous forested areas (Hoover and Leab 1967; Smith 1974; Golding and Swanson 1978; Haupt 1979). Spring melt rates in these openings are higher and begin two to four weeks sooner (Houpt 1979, Chamberlin 1982; Kattelmann, et al, 1983, Troendle 1983). Snow melt and runoff generally progress from lower elevations to higher elevations as sun angle and temperatures increase. Creating additional openings at higher elevations will increase the melt rate at these elevations. If these flows become synchronized with runoff from lower elevations the potential for increased downstream peak flow is increased (Christner 1981). Increased peak flows have the potential to destabilize stream channels and slow recovery of streams that are moving toward a more stable condition. Natural attenuation of flows as they move downstream works to mask this effect. Research studies have not detected significant changes in peak flows where logging has been conducted without severe soil disturbance (Ellison, 1981; Harr 1976). See Effects on Soil, this Chapter.

Evaluation of the proposed Forest alternatives based on their effects on timing of runoff is difficult. The potential for synchronization of flows in conjunction with soil disturbance increases with increasing rates of timber harvest. Late season low flows will not likely be affected by any of the alternatives because of shallow soils and low summer rainfall.

No accurate estimate of the effects of grazing by alternative on water quantity or timing is possible. Measurable impacts would most likely be site specific and as such could be addressed through mitigation.

Indirect Effects

Indirect effects are often difficult to separate from direct effects; they interact with almost every aspect of the water/riparian resource, and they are some of the most important impacts to be dealt with by land managers.

The ultimate effect on water quality is determined by how much sediment reaches a watercourse and the value placed on the use of that water, e.g. fish production, irrigation, recreational or domestic use (Forest Service Policy 2526-1). Sediment can smother fish eggs and fry, smother and scour stream bottom plants and aquatic organisms that anchor the food chain, cloud water, abrade fish gills, and reduce visual appeal of waters used for recreation. Sedimentation also increases the cost of treating water destined for human use. Filling in of reservoirs is another cost of sedimentation. In this case, estimates of the amount of sediment contributed by each of the alternatives is less than seven percent above natural or background levels (see Effects on Soils, and Wildlife and Fish, this Chapter).

Cumulative Effects

Cumulative effects are the sum total of individually minor but collectively significant actions taking place over a period of time. Approximately half of the over 800 miles of Class I and II streams and adjacent

riparian areas (on the Forest) are in an unacceptable condition in that they do not meet management requirements for temperature and turbidity. This provides strong evidence that these drainages have suffered the cumulative effects of past road construction, timber harvest, and grazing.

Research indicates that measurable changes in runoff occur when 20-30 percent of a drainage is in a cutover condition (Brown, et al, 1974; Rich and Thompson 1984; and Troendle and Leaf 1980). Water quality, water quantity, and runoff timing may all be affected. These changes may be negative and often are cumulative.

Preliminary analysis of FORPLAN runs indicated that if unconstrained, over 90 percent of the timber harvest in the first decade of the Plan would be scheduled on the high value, extensively roaded ponderosa pine stands located in drainages with predominantly south and southwest aspects.

Further analysis showed that up to 70 percent of the acres in some drainages would be treated in the first decade. This would result in over 40 percent of a drainage being in an equivalent harvest (EHA) condition, a situation judged to have potentially unacceptable impacts on water quality. In addition, in the second decade, the harvest would shift to the steeper, mixed conifer drainages characterized by more erosive soils and high value anadromous fishery streams, further exacerbating potential watershed damage.

The Forest Service Manual directs that where prescribed cutting methods may be detrimental to watershed conditions, including water quality, limits be set on the timing of operations and the percent of watershed coverage per entry (FSM 2405.13, 3b).

To assess the effect of proposed rates of harvest by alternative, threshold values were established for each of the 24 major watersheds on the Forest. These threshold values were chosen to reflect the ability of each drainage to absorb disturbance, both natural and human-caused and to recover in a reasonable period of time without long-term damage to channel stability or water quality. Threshold values range from 25 to 35 percent and take into consideration channel condition, soils, roads, livestock use, fishery values etc. The weighted acreage for all watersheds on the Forest is 30.1 percent. In other words, up to 30.1 percent of the Forest can be in an equivalent harvest area (EHA) condition without exceeding the natural ability of a watershed to absorb impacts without unacceptable damage.

An analysis of the proposed alternatives for potential cumulative effects indicates that only Alternative No Change (which exhibits an EHA of 32.2 percent) has a high risk of causing long-term impacts to watersheds (Table 2-8, Table 4-35). The degree of risk is determined by the probability of experiencing a major storm event (10 to 25 year) during that period when a watershed is hydrologically sensitive. In the case of Alternative No Change, there is a

TABLE 4-35
EQUIVALENT HARVEST AREA BY ALTERNATIVE
(Percent)

	ALTERNATIVE					
Decade	NC	B-MOD	E-DEP	I Preferred	A	C-MOD
1	* 32 2	29 6	29 2	25 6	27 8	24 2
2	25 5	25 2	24 3	20 1	25 9	18 9
3	18 5	21 6	17 2	20 6	19 3	18 7
4	24 6	23 0	18 3	17 6	20 7	16 9
5	26 7	28 5	21 7	21 8	24 3	19 1

* The Forest EHA Threshold (30 1) will be exceeded

likely chance that a 10 percent chance storm event will occur on one or more watersheds on the Forest in the next decade with long term effects on channel stability, the riparian zone, and water quality.

A ten percent chance storm event is a ten percent chance of flooding in any given year.

Mitigation Measures

The National Forest Management Act (NFMA) of 1976 requires that timber will be harvested from National Forest System lands only where watershed conditions will not be irreversibly damaged by changes in water temperature and deposits of sediment. The following mitigation measures are proposed to meet this direction.

Mitigation includes a range of actions aimed at reducing the impacts of management activities, and includes: best management practices (BMP's), structural and nonstructural improvements, dispersion, and monitoring. Other relevant mitigation measures can be found in Effects on Soils, this chapter.

Best Management Practices (BMP'S)

BMP's encompass a broad range of measures designed to mitigate on-site or site-specific impacts by correcting a recognized problem. Mitigation measures common to all alternatives are contained in Appendix G. These measures, including buffer strips along streams, use of designated skid trails, specific criteria for stream crossings, etc., are designed to achieve a high rate of success (90 percent or greater). However, the degree and quality of implementation is highly variable, ranging from poor to excellent. Unexpected or unusually severe climatic events, availability of funding and staffing, knowledge and understanding of the BMP's by operators and administrators are reasons why many of these BMP's are often only 60 to 80 percent effective.

Improvements in the degree and quality of BMP implementation would be the most effective measure for mitigating some of the potential risk/impact of managing above Forest threshold value as in Alternative NC.

Mitigation after the fact is often not as effective in reducing impacts to the water resource as reducing or controlling the initial amount of impact. Examples include: mitigation of soil compaction through ripping and tillage is seldom as effective in maintaining the hydrologic properties of a soil as is the use of designated skid trails to control the amount of an area impacted during management activities. Development of self maintaining roads, though more costly in the initial design and construction stages, often provide significant advantages over time in reducing overall impacts on water quality and runoff. With this in mind, every effort should be made to select BMP's which avoid or prevent a problem rather than attempting to correct a problem after the damage has occurred.

Structural and Nonstructural Improvements

Structural and nonstructural improvements are more site specific than BMP's. They are designed to improve productivity, stability or diversity of an area in order to increase its ability to absorb impacts. Examples include: water developments, salt block placement and grass seeding designed to draw grazing animals away from riparian areas, fencing or herding to reduce pressure on sensitive areas; altering the grazing system or changing from cattle to sheep to achieve specific end results. Structural and nonstructural improvement measures also include installing log weirs for improved fish passage, planting willow and alder to improve streamside shade or managing beaver populations to rehabilitate degraded watersheds.

A detailed watershed improvement schedule will be applied to all alternatives. Alternatives B-Modified, I and C-Modified will contain improvements designed to bring all streams/riparian areas to an excellent condition. Alternative E-Departure has a fairly aggressive improvement schedule although only 19 of the 24 watersheds on the Forest will be managed for excellent conditions. A less aggressive schedule is proposed in Alternatives A and C-Modified with 7 of 24 and 22 of 24 watersheds respectively, managed for excellent conditions, but at a slower pace (see Table 2-8, Chapter 2).

Dispersion of Timber Harvest and Grazing Activities

Each of the alternatives includes constraints on the amount and location of timber harvest over time. The goal of this harvest dispersion is to desynchronize the arrival of individual effects of activities at some critical point downstream (Rice 1981). The farther downstream the effects of logging or road construction occur, the more the effects of that synchronization will be reduced, so long as channel sensitivity is constant. The extent of these effects, such as increased runoff or sediment from disturbed sites, will vary in seriousness, predictability and controllability.

More stringent forage utilization standards, combined with structural improvements designed to draw livestock away from riparian areas, should help to reduce grazing impacts in all alternatives.

Monitoring

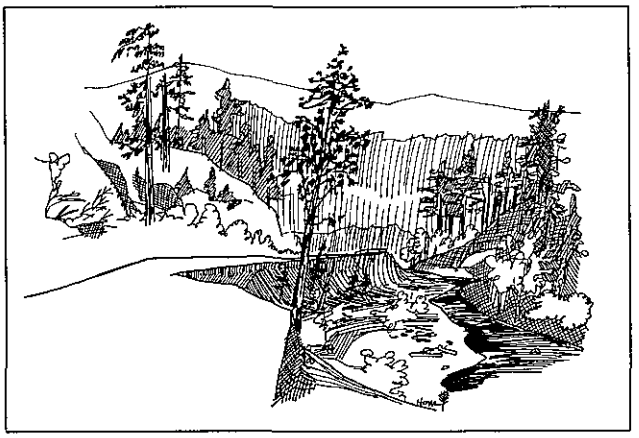
Monitoring serves as a check on the effectiveness of mitigation measures. It identifies necessary adjustments in the level and type of mitigation required to meet management requirements.

The cumulative effects process described above will be employed at the project/watershed level to assess risk and to assure optimum distribution of harvest affects among watersheds.

Conflicts with Other Plans and Policies

There are no known conflicts with the management plans of adjacent landowners or agencies. Throughout the planning process, the Forest has been in contact with the Oregon State Forestry Department, Oregon Department of Fish and Wildlife, local soil conservation agencies, county planners and the Bureau of Land Management.

Wild and Scenic Rivers



The Oregon Omnibus Wild and Scenic Rivers Act of 1988 designated the Deschutes River, the Crooked River, and the North Fork of the Crooked River as Wild and Scenic. The Wild and Scenic Rivers Act defines three classes of rivers: wild, scenic, and recreational. Wild river areas are those rivers, or sections of rivers, that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America. Scenic river areas are those rivers, or sections of rivers, that are free of impoundments, with shorelines or watersheds still largely primitive and natural appearing. Limited access by roads may occur in places. Recreational river areas retain natural, free flowing characteristics, but shorelines may show evidence of some agricultural or forestry uses, past water diversions, or existing minor improvements or diversions. The river segments that have been designated are further described as follows:

Deschutes River - The portion of the Deschutes River that flows through the Crooked River National Grassland has been designated as scenic. This wild and scenic river area is to be managed by the Bureau of Land Management.

Crooked River - The portion of the Crooked River that flows through the Crooked River National Grassland has been designated as recreational. This wild and scenic river area is to be managed by the Bureau of Land Management.

North Fork of the Crooked River - The portion of the North Fork of the Crooked River that flows through the Ochoco National Forest has been designated in three segments. The first segment, from the river source to where the river enters the Big Summit Prairie has been designated as recreational. The second segment, from where the river exits the Big Summit Prairie to the confluence of Deep Creek, has been designated as recreational. The third segment, from the confluence of Deep Creek to the Ochoco National Forest boundary, has been designated as scenic. The portion of this river, between segments one and two, that flows through the Big Summit Prairie (private land), has no official designation under the Oregon Wild and Scenic Rivers Bill.

Lower Squaw Creek has been determined to be eligible and suitable for designation as a "scenic river" in the Wild and Scenic River system. A 7.5 mile segment of the creek, 1370 acres, from the Grassland boundary to its confluence with the Deshutes River, would be recommended for designation. This recommendation would be a preliminary recommendation that would receive further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has reserved the authority to make final decisions on designation of rivers as part of the Wild and Scenic Rivers System.

Direct Effects

The corridors of designated Wild and Scenic Rivers are protected in all alternatives. The effects of the alternative on Wild and Scenic Rivers will not change. Lower Squaw Creek, which would be recommended for designation in Alternatives B-Modified and I would be protected for its scenic river qualities in those alternatives. Protection is afforded through inclusion in the Squaw Creek Management Area.

Livestock grazing along the segments of rivers designated for Wild and Scenic Status affects water quality as well as the presence and quality of the riparian vegetation.

Timber harvest within the corridor would be planned to protect and enhance the qualities of these river corridors. Harvest adjacent to the corridor could affect the quality, timing and quantity of water in the rivers. Harvest might also temporarily disrupt the access to and serenity of the area. This could vary by alternatives based on the intensity of harvest. Uneven-aged management would be emphasized over even-aged management practices and the impacts of harvest over time would be reduced.

Indirect Effects

Legislative designation of areas to the Wild and Scenic River System does establish management emphasis and precludes other alternative land uses or allocations not in harmony with the management objectives for wild, scenic or recreation rivers.

Cumulative Effects

The "outstanding/remarkable" attributes of the designated Wild and Scenic Rivers are not expected to significantly change as a result of management activities programmed within any of the alternatives.

Both timber harvest and recreation use can have a cumulative effect on the Wild and Scenic River resource. The Forest and Grassland seek to implement management practices designed to protect the character of the Wild and Scenic River corridors for all the alternatives.

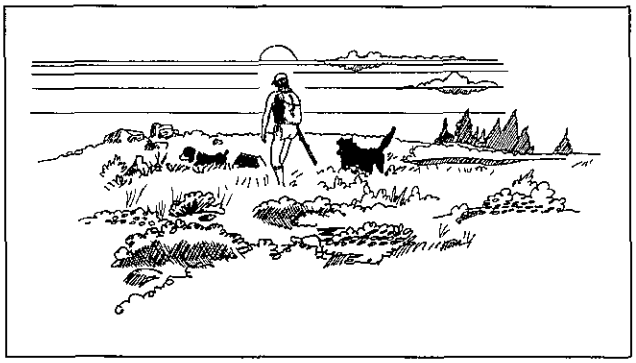
Mitigation Measures

The management of the designated sections of Wild and Scenic Rivers will be developed in management plans by 1991, which will be tiered to the Forest and Grassland Plans. All outstanding/remarkable features will be protected through mitigation of other resource projects. The Lower Squaw Creek area which would be recommended for inclusion in the Wild and Scenic River System, in Alternatives B-Modified and I, would be managed to protect those values key to the recommendation.

Conflicts with Other Plans and Policies

No conflicts are anticipated with the plans and policies of other agencies. Management of those Wild and Scenic River segments which transgress Forest, Grassland and BLM administered lands will be coordinated between agencies.

Wilderness



The Oregon Wilderness Act of 1984 designated Black Canyon, Bridge Creek, and Mill Creek as Wilderness Areas on the Ochoco National Forest. The fate of the Deschutes Canyon/Steelhead Falls unroaded area was left to be determined through Forest Planning. This section discusses the effects that are incident on these areas and how the effects vary by alternative.

Direct Effects

There are a number of activities that have a direct effect on wilderness but these effects do not vary between alternatives. Valid mining activities will continue to affect the wilderness by the use of motorized vehicles and equipment, access routes and associated ground disturbances. Livestock grazing and associated approved improvements and approved use of mechanized and motorized equipment to maintain the improvements can detract from the wilderness experience.

Recreation use in wilderness could vary by alternative depending on how much of the unroaded areas outside wilderness becomes developed for other resource concerns. In alternatives B-Modified and A, as the unroaded areas become developed and no longer available for the semiprimitive nonmotorized recreation experience, more people will be displaced into wilderness for the more primitive recreation opportunities. The sites and sounds of forest industrial operations may detract from the user's wilderness experience along access routes to a wilderness area. This effect would be most extreme under Alternatives B-Modified and E-Departure. These effects could detract from the experience of those seeking the wilderness experience.

The amounts of wilderness acres vary by alternative due to the different management strategies for the Deschutes River/Steelhead Falls Wilderness Study Area. The wilderness qualities of this study area are protected in all alternatives, but to different degrees. Degree of protection depends on where motorized activities in conjunction with grazing are allowed. Alternative C-Modified recommends all of the areas (10,000 acres) that minimally meet wilderness standards for wilderness designation. This area contains some nonconforming features, such as roads and powerlines. Alternative E-Departure recommended only the pristine canyon area of 2,500 acres of Grassland and 2,660 acres of BLM be recommended for wilderness. Alternatives A and No Change protect the full study area as a semiprimitive nonmotorized recreation area but do not recommend wilderness. Alternative I manages over 5,100 acres of the study area as part of the 7,840 acre Squaw Creek Management Area. This area will be managed for unroaded semiprimitive nonmotorized recreation opportunities. The main access road dividing the area will be closed seasonally to protect wintering deer herds, and should have little impact on summer canyon use except at the ford of Squaw Creek.

Indirect Effects

Alternative C-Modified, which recommends acres of the Deschutes Canyon/Steelhead Falls roadless area to wilderness, will limit grazing and cause a decrease in livestock use due to the inability to transport water daily by motor vehicle. None of the other alternatives would affect grazing in the area recommended. E-Departure recommended excluded areas needing motorized water transportation.

Mining is affected by wilderness; no new claims will be allowed and existing claims are closely monitored. Only motorized and mechanized equipment that is absolutely necessary for the mining will be allowed.

Recreation is affected by wilderness since no facilities other than those needed to access trails will be developed. Limits of acceptable change are established to monitor the effects of use in the wilderness and to change recreation use patterns when limits are exceeded. No mountain biking, hang gliding, or other mechanized-motorized recreation can occur.

A fire management plan will be developed for each wilderness area that establishes prescription criteria for managing fires as a natural part of the environment. Some natural ignitions may be allowed to burn unless significant resource damage is expected, in which case the fire will be declared a wildfire and suppression action will go into effect. Suppression actions will be designed to minimize human impacts on wilderness.

Fire management strategy in wilderness is designed to protect or enhance wilderness resource values. Where analysis has shown that the wilderness ecosystem has been significantly altered from its natural state due to fire exclusion and that the probability of lightning ignition returning it to its natural state is low, scheduled ignitions will be considered.

Additionally, the timber resource may be affected by wilderness designation. Because wilderness vegetation remains unmanaged, tree vigor will decline and forest pests such as the spruce budworm may reach outbreak levels. Infestations may then spread beyond wilderness boundaries into forest zones dedicated to multiple use management. This effect would be minimal in the Deschutes Canyon/Steelhead Falls area where grass and shrub vegetation comprise the dominant plant communities.

Cumulative Effects

Some nonconforming features, improvements, and conditions currently exist in the wilderness. Additional nonconforming conditions may legally be necessary for the development of prior existing valid mining claims. These developments create additional unnatural conditions that cumulatively may be detrimental to the wilderness resource. In addition, progressive trail development may have cumulative effects on the supply of primitive recreation experiences.

As unroaded areas outside wilderness become developed for other resource management objectives, recreational use of the wilderness will increase. The increased number of wilderness users could exceed the capacity to provide a primitive experience and conditions could occur that exceed the limits of acceptable change.

Mitigation Measures

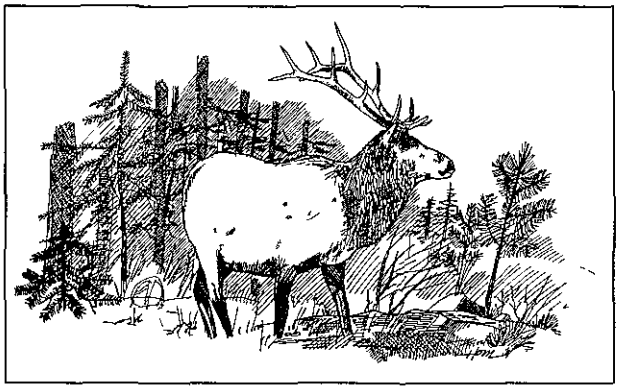
All management of wilderness is guided by the Wilderness Act of 1964 which strongly directs management toward pure untrammeled wilderness. The Act also allows some prior existing rights to continue. Such operations will be permitted with provisions to protect wilderness values as much as practical. The use of motorized and/or mechanized vehicles for these excepted activities will be scheduled to minimize conflicts with wilderness values and wilderness users as much as possible. Ground disturbing activities will be bonded to ensure restoration/reclamation of the area will be completed in a timely manner. Nonconforming features will be removed when feasible.

Conflicts with Other Plans and Policies

The Jefferson County Comprehensive Plan does not support the creation of additional Wilderness within the bounds of Jefferson County. Consequently, a conflict occurs with Alternatives C-Modified and E-Departure which allows for wilderness recommendation for all or portions of the Deschutes Canyon/

Steelhead Falls Area. No other conflicts arise with any of the proposed management strategies for the unroaded areas of the Ochoco National Forest.

Wildlife and Fish



Direct Effects

Management indicator species were selected to simplify the evaluation of impacts on terrestrial vertebrate species with different habitat requirements. Theoretically, the effects on the selected species represent the effects on other wildlife species with similar habitat requirements. Under no alternative would management indicator species populations and their habitats be adversely effected to the point where minimum viable populations could not be maintained (see Appendix F, Management Requirements).

Effects by Alternative on Elk Populations and Habitat

Timber harvest affects the spatial relationships of cover and foraging areas as well as the ratio and juxtapositioning of each that occurs over an area. The amount, type, and interspersion of forage, water, and cover (habitat components) can result in effects on big game and other wildlife habitat and use.

Cover is an important component of elk habitat. It is utilized by big game in part to modify climatic effects on body temperatures, which results in increased metabolic efficiency (Beall, 1974; Edgerton and McConnell, 1976; Leckenby, 1984), and for security. Timber management and applied silviculture practices can influence habitat through changes in cover quality and quantity (cover/forage ratio) and associated road densities.

Timber harvest utilizing clearcutting and shelterwood temporarily eliminates or alters cover. Thinning practices may reduce the quality of the cover. Timber management may also have positive effects on the quality and quantity of cover; e.g., harvesting of stands that do not provide cover and reforesting the sites with stands adequate to provide improved tree stocking and canopy closures; and in some cases managing to defer or reduce harvests in stands recognized to be important for providing cover.

All alternatives have an effect on cover from timber harvest and management. Standards and guidelines have been developed (Appendix D) that control the cover requirements and amounts in various management areas to meet habitat effectiveness objectives for elk.

Roads affect elk habitat by directly removing habitat area. Vehicular traffic also decreases the effectiveness of adjacent roaded habitat (Pederson, 1978). Studies have demonstrated that elk use increases proportionately as distance from roads increases (Hershey and Leege, 1976; Perry and Overly, 1977; Pederson, 1978, Long, 1980), and increased road densities reduce habitat effectiveness (Hershey and Leege, 1976; Lyon, 1979). Generally it is the associated traffic, not the roads themselves which discourage use by big game (Hershey and Leege, 1976; Perry and Overly, 1977).

A model was used to predict the influence of forest management on elk and habitat effectiveness. Table 2-8, Chapter 2, shows the model results/elk numbers for each alternative. It is a biologically based model dealing with habitat effectiveness for elk. It was designed to estimate effectiveness on a scale of 0 to 180, with 180 representing the highest potential and 0 representing the least desirable situation. It is a relative measure of effectiveness only and does not consider all factors that could influence the actual population. Some of the additional factors may include: effects of hunting, predators, disease, yearly changes in weather, forage production, competition with other animals, and reproductive rates.

To make the results of the model easier to interpret, the effectiveness index was translated into number of animals. This was done by estimating the density of animals that could be supported on an area if the habitat were maintained at optimum effectiveness. For the Ochoco National Forest this was an average of nine elk per square mile. The habitat effectiveness value of 180 translated to this possible density of elk. Lower values translate to proportionally lower densities. The numbers are not necessarily projections of actual elk populations but provide basis for relative comparisons between alternatives. As noted above, many additional factors would have to be considered in order to predict actual populations.

It is also important to note that present elk populations may not be the direct result of factors that are used in the habitat effectiveness model. The current population in an area can be limited by availability of winter range on private land, by hunting pressure, or by any of the other factors discussed above. In this case, habitat effectiveness may change, but still have no influence on the number of elk. Thus, the numbers shown in tables and graphs represent modeled projections only and cannot account for factors outside the model. It is important to understand this in order to relate how the effect of forest management on the elk population was predicted (see Table 4-36).

habitat is capable of supporting higher deer populations during this time frame, the Oregon Department of Fish and Wildlife intentions are to keep the population at current levels. They feel deer winter range carrying capacities, which are mostly outside the Forest, have been reached. In the third decade, it is predicted deer populations may begin to decline for Alternative B-Modified. This is a result of reduced habitat caused by intensive timber management activities. All other alternatives remain constant through the fifth decade (see Table 2-8, Chapter 2).

Effects of Livestock Grazing on Big Game

Livestock grazing can affect big game habitat through competition for forage. An analysis was made to determine the amount of forage produced on the Forest and identify if significant competition for forage potentially existed Forest-wide. The model showed that, theoretically, an abundance of forage remained in all alternatives after the needs of both big game and livestock had been met. This assumed, however, that animals were evenly distributed throughout the Forest. Localized conflict could occur in areas of high animal concentrations or in particular habitats. Conflicts between elk and cattle were not quantifiable at the Forest planning level, but will be considered and evaluated on an allotment plan basis when each plan is updated.

Carefully controlled livestock use can improve quality of winter forage for big game on grass ranges if it is properly timed. Removing plant growth or using it

TABLE 4-36
ELK POPULATION

	ALTERNATIVE					
Decade	NC	B-MOD	E-DEP	I Preferred	A	C-MOD
1	*	3,210	3,170	3,000	3,370	3,740
2	*	2,950	3,030	2,870	3,160	3,660
5	*	1,700	2,780	2,620	2,690	3,700

* Although the NC Alternative was not actually evaluated for elk production using the model, elk numbers are expected to be quite similar to those shown for B MOD The reasons for the similarity are due to the similar effects that both alternatives would have on habitat effectiveness

Effects on Deer Populations

Deer numbers have been projected to remain constant at an estimated 22,600 animals during the first two decades for all alternatives. Even though the