United States
Department of
Agriculture

Forest Service

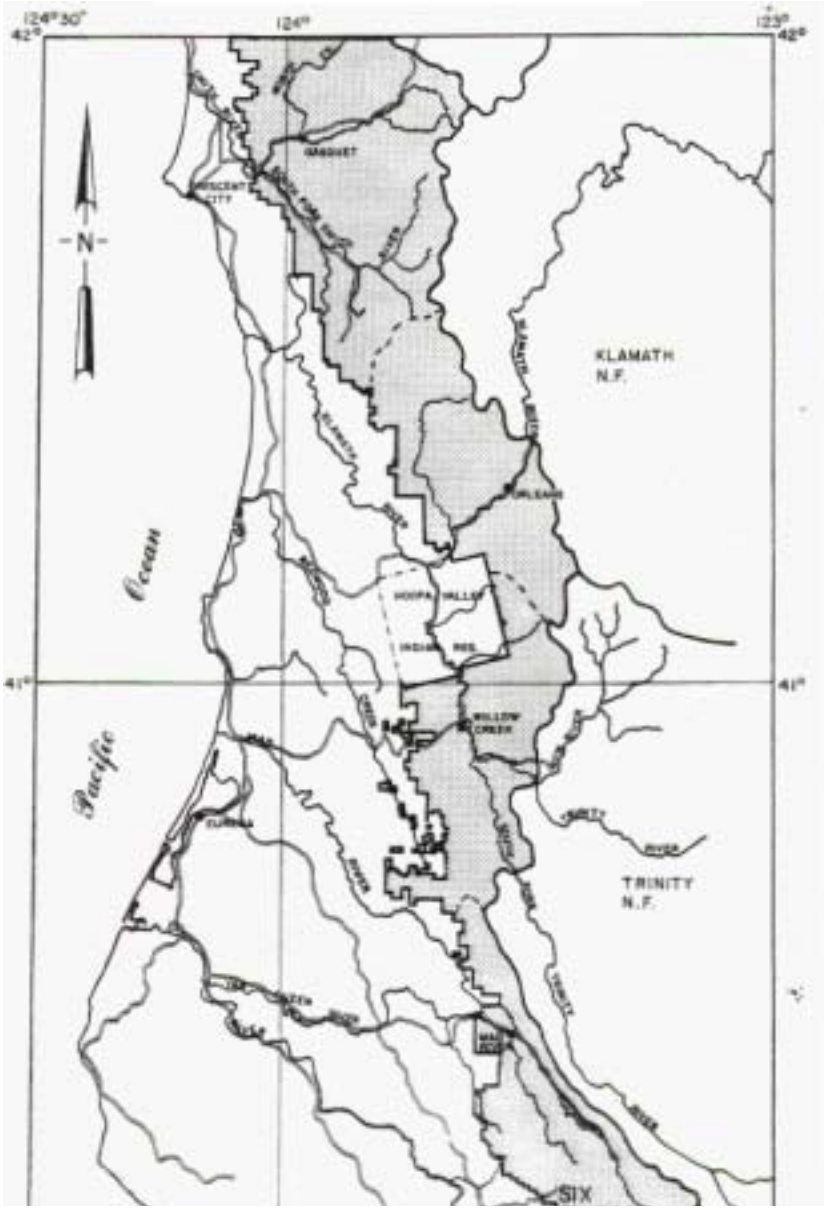
Pacific
Southwest
Region

**Six Rivers**
**National Forest**

# Final Environmental Impact Statement

## Land and Resource Management Plan

# VICINITY MAP




# SIX RIVERS NATIONAL FOREST

# FINAL
# ENVIRONMENTAL IMPACT
# **STATEMENT**

## SIX RIVERS NATIONAL FOREST PLAN

***Located within***
***Del Norte, Humboldt, Siskiyou, and Trinity Counties, California***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This document and its supportive analysis provides specific disclosure of the effects of implementing alternative management strategies for a period of 10 to 15 years. Estimates beyond this point are displayed for the decision-maker and for public information.

This environmental impact statement describes five alternatives regarding the management of lands and resources on the 958,480-acre Six Rivers National Forest. These alternatives present a range of emphases regarding resource management on the Forest. In addition to displaying alternatives, this statement discusses the estimated effects of implementing each of these alternatives and compares the outputs, costs, effects, and impacts of their implementation.

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# PURPOSE AND NEED

## INTRODUCTION

This chapter introduces the need for, and legal parameters of, the analysis undertaken in this document, as well as the nature of policy decisions to be reached based on the analysis. Included are summaries of issues identified by the public and the Forest Service as key to the future of the Forest, how issues were surfaced, and a list of all issues raised and considered.

## PURPOSE AND NATURE OF THE ACTION

The purpose of this project is to develop a Forest Plan in accordance with the requirements of the National Forest Management Act and implementing regulations, to direct and guide all resource management activities on the Six Rivers National Forest for the next 10 to 15 years.

The purpose of Forest management is to allow multiple use of lands and provide a sustained yield of goods and services in a manner that maximizes "net public benefits" and preserves environmental quality. Net public benefits are the overall, long-term value to the nation of all outputs and positive effects (benefits) less all negative effects (costs), whether or not they can be quantified. This basic philosophy and conservation ethic for resource use was legislated as the Multiple Use-Sustained Yield Act of 1960. Deciding how the Six Rivers National Forest will be managed over the next 10 to 15 years is a requirement of the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). Two additional laws, the National Environmental Policy Act of 1969 (NEPA) and the Endangered Species Act as amended in 1988, greatly influence the planning process. NEPA directs that any Federal decision or action with a potentially significant impact on the human environment (in the NEPA context, the natural and physical environment and the relationship people have with that environment) be preceded by an Environmental Impact Statement.

One purpose of the Environmental Impact Statement is to provide decision makers with an environmental disclosure document sufficiently detailed to aid them in the selection of management alternatives for the Forest. An equally important purpose is to make information on the environmental effects of the alternatives available to the public, and to enable public participation in the review of that information.

This Final Environmental Impact Statement (FEIS) presents five alternatives. The alternatives describe different ways of managing the land and resources of the Six Rivers National Forest. Each alternative will address major local, regional, and national issues, management concerns, and resource use and development opportunities. To aid in the selection of management direction for the Forest, the FEIS also describes each environment that would be affected and the related environmental consequences of implementation under each of the alternatives.

Every alternative generates a different mix of goods and services that can be produced from the Forest resource base. Forest decision makers evaluate each alternative to determine its potential to provide a sustained yield of those products. Their goal is to find ways that maximize long-term public benefits while responding effectively to the public issues. Net public benefit (NPB) expresses the overall long-term value to the nation of all outputs and positive effects (benefits), less all associated inputs and negative effects (costs). Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index, and are an expression of values that incorporate the principles of multiple use and sustained yield. A preferred alternative is the alternative which, in the opinion of the Forest Service staff, best achieves these goals. This preferred alternative is the basis for the accompanying Final Land and Resource Management Plan (Final Forest Plan).

The purpose of the Final Forest Plan is to direct and guide all resource management activities on the Six Rivers National Forest for the next 10 to 15 years. For disclosure purposes under the provisions of the National Environmental Policy Act, this FEIS and the accompanying Final Forest Plan are treated as combined documents. These documents present management direction for the 10-15 year life of the Forest Plan, with projection of outputs, costs, and environmental consequences for a 50 year period. The Plan allocates land for both broad and specific purposes and establishes standards and guidelines for all resource management activities (see standards and guidelines in Glossary, Appendix G).

All Forest management activities approved after the approval of a forest plan must be consistent with that plan. All permits, contracts, and other instruments for the use and occupancy of National Forest system lands and resources in existence at the time the forest plan is adopted must be made to conform to the Forest Plan as soon as practicable.

## DISPOSITION OF EXISTING PLANS

The Forest is currently managed through direction contained within District Multiple Use Plans from 1969, the 1971 Timber Management Plan, the 1978 Sierra Club Settlement Agreement, the Fox and Eightmile/Blue Creek unit plans, and various functional resource management plans, as well as direction provided by other sources including the Forest Service Manual, Forest Service Handbooks, the Code of Federal Regulations (CFR) and numerous environmental documents, laws, regulations, and executive orders. Most of the existing plans under which the Forest is managed do not provide the direction needed to appropriately meet the intent of NFMA and do not adequately address or have the ability to resolve many of the current issues and concerns of Forest management. The analysis conducted for older plans seldom met current standards. Disposition of existing plans will be as follows:

**Plans Superseded by the Forest Plan.** The following plans are obsolete and will be superseded by the Forest Plan when it is approved:

1969 District Multiple Use Plans
1969 Land Adjustment Plan
1971 Timber Management Plan
1974 Fox Unit Plan
1974 Fox Monitoring Plan
1975 Eightmile/Blue Creek Unit Plan
1978 Sierra Club Settlement Agreement
1979 Off-Road Vehicle Plan
Ruth Lake Bald Eagle Territory Management Plan

**Plans Incorporated into the Forest Plan.** Management direction for the Smith River National Recreation Area (Smith River NRA) will be guided for this planning period by the Smith River NRA Management Plan. The Smith River NRA Management Plan dated February, 1990, has been revised to be consistent with the Smith River NRA Act. The revised plan is incorporated in its entirety into the Forest Plan for the Six Rivers National Forest, as directed in the Smith River NRA Act of November, 1991.

Management direction for the wild and scenic river corridor of the South Fork of the Trinity River is guided by the South Fork of the Trinity Wild and Scenic River Management Plan dated August 1992.

The Six Rivers National Forest is working with the Shasta Trinity and Mendocino National Forests to develop a management plan for the Trinity Alps Wilderness. The management plan is not expected to be complete until after the approval of the Six Rivers Forest Plan; therefore, the Forest Plan will be amended to incorporate direction from the wilderness management plan.

**Other Plans.** Existing resource and functional management plans not identified above contain some site-specific direction that is consistent with the Final Forest Plan and other sources of direction, such as laws, regulations, and Forest Service directives. The consistent site-specific direction in these plans will be used to guide activities until implementation plans and/or schedules that conform to the Forest Plan are completed to replace existing resource and functional management plans. A list of plans incorporated into the Forest Plan and plans needed to implement the Forest Plan is included in Chapter 5 of the Plan.

The Forest has co-signed some resource management plans prepared by other resource agencies. These plans will continue to be used to guide resource activities that are not inconsistent with the Forest Plan. An example of such plans are the deer herd management plans prepared by the California Department of Fish and Game. These plans are also discussed in Chapter 5 of the Forest Plan.

## THE PLANNING PROCESS

All direction governing Forest Service programs and operations is set forth in, or derived from, Federal statutes enacted by Congress, as well as the regulations and administrative directives that implement these laws. The principal laws governing Forest Service programs can be found in Agriculture Handbook No. 453. The following laws are pertinent to Forest Service planning:

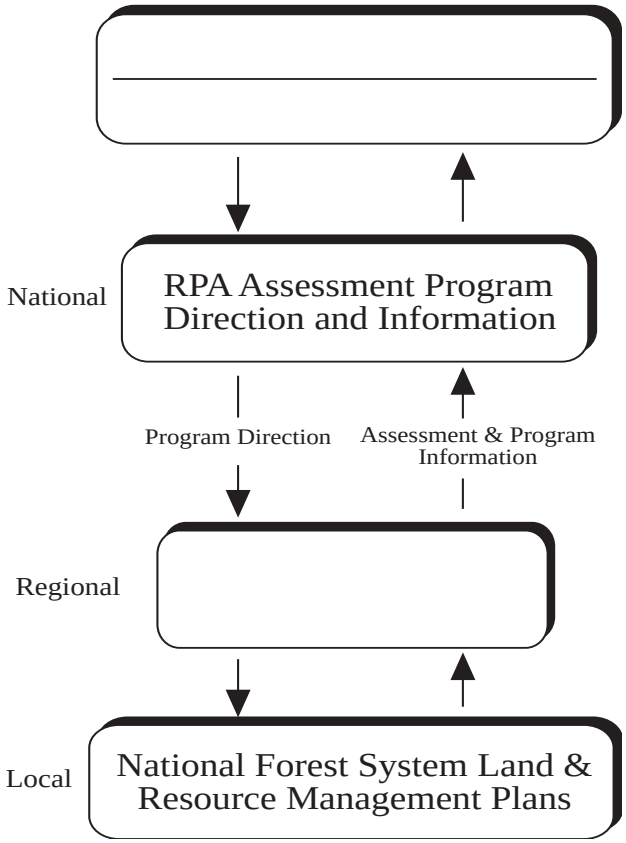
- Organic Administration Act of 1897 (30 Stat. 11; 16 U.S.C. 473)
- Multiple Use-Sustained Yield Act of 1960 (74 Stat. 215; 16 U.S.C. 528)
- National Environmental Policy Act of 1969 (NEPA) (83 Stat. 852; 42 U.S.C. 4321)
- Forest and Rangeland Renewable Resource Planning Act of 1974 (RPA) (88 Stat. 476; 16 U.S.C. 1600)
- National Forest Management Act of 1976 (NFMA) (90 Stat. 2949; 16 U.S.C. 1600)
- Endangered Species Act (ESA) as amended in 1988 (87 Stat. 884; 16 U.S.C. 1582).

The Code of Federal Regulations (CFR) contains direction to implement the provisions of these laws. Planning activities must also conform to Department of Agriculture regulations contained in the Forest Service Manuals and Handbooks.

The objective of planning is to provide a sound basis for decision making in developing and managing Forest Service programs. Under RPA, NFMA, and the related implementing regulations, Forest Service staff developed a comprehensive and dynamic planning system which integrates the three administrative levels of the Forest Service. The overall planning system includes the RPA Program at the national level, regional guides for each of the nine Forest Service administrative regions, and land and resource management plans (called forest plans) for the 156 National Forests and Grasslands. (See Figure I-1).

Figure I-1.

**Framework for Planning in the Forest Service**




### NATIONAL LEVEL

RPA requires the U.S. Department of Agriculture to prepare a program for Forest Service activities every five years. The 1990 RPA Program provides an opportunity to integrate social needs and resource management programs and serves the long term strategic planning needs of the Forest Service. It provides broad national guidance for program emphases and trends, rather than specific, quantified output targets for individual Forest Service programs, and influences the development of program budgets.

The 1990 RPA Program was developed from the 1989 RPA Assessment which (a) analyzed the status, condition, and trends of the forest and rangeland resources in the United States, and (b) included projections of the demand for and supply of all the nation's renewable resources over the next 50 years. The 1990 RPA Program also included information from the regional and forest levels.

### REGIONAL LEVEL

Each Region develops a regional guide that distributes the Region's portion of the national objective to each National Forest. The regional guide also provides standards and guidelines for various management activities on the National Forests and provides planning direction for developing individual Forest Plans. "The Regional Guide for the Pacific Southwest Region," (Regional Guide) dated August, 1984, provides this direction for the Six Rivers National Forest.

### FOREST LEVEL

Each Forest prepares a Forest Plan, which is associated with an Environmental Impact Statement. The EIS considers various mixes of resource objectives, or alternatives. At least one of the alternatives must meet the 1990 RPA objectives. The analysis of the effects of the alternatives provides valuable information to the regional and national programs regarding Forest capabilities and programs.

Project level environmental analyses and decisions will be tiered to the Forest Plan Environmental Impact Statement [40 CFR 1508.21] (see Glossary for definition of tiered environmental analyses). Additional site-specific analysis for project-level decisions will be included in these subsequent documents.

The Forest Supervisor will review the condition of the lands covered by the Plan at least every five years to determine whether conditions or demands of the public have changed significantly. The Plan may be revised in 10 years, if needed to meet changing conditions; at a minimum, it will be revised in 15 years. This process ensures that the Forest Plan is responsive to changing conditions.

The planning processes specified in the NFMA implementing regulations, and in the environmental analysis process specified by CEQ regulations, were used in developing this FEIS and the accompanying Final Forest Plan.

### PLANNING RECORDS

All documents and files that chronicle the Forest planning process are available for review at the Supervisor's Office, 1330 Bayshore Way, Eureka, California 95501. These "planning records" contain the detailed information and decisions used in developing this FEIS and the Final Forest Plan. The planning records are referenced at appropriate points in the text and appendices of this FEIS and the Final Forest Plan.

The DEIS and Draft Forest Plan were circulated for public review and comment in the fall of 1993. Public comments were incorporated into this Final Environmental Impact Statement (FEIS). The FEIS will be used by the Regional Forester to approve the Forest Plan as submitted or with modifications. This decision will be documented in a Record of Decision which will be available to the public.

A glossary which defines terms, units of measure, and abbreviations used in the FEIS is included as Appendix G; a list of references cited in the FEIS is included as Appendix L. Management area maps for each alternative are included in a separate envelope accompanying this document.

Acreages in the FEIS and Final Forest Plan, unless otherwise indicated, have been rounded to the nearest 10 acres for consistency and ease of use.

## LOCATION

The Six Rivers National Forest lies east of Highway 101 in northwestern California. It extends from the Oregon border south to Mendocino County (see map, inside front cover). The Forest is approximately 140 miles long (north/south axis) and averages about 12 miles across. Forty-three percent of the Forest is in Del Norte County, 35 percent in Humboldt County, 21 percent in Trinity County, and 1 percent in Siskiyou County. The administrative boundary of the Forest encompasses approximately 1,092,170 acres. Of this total, 958,470 acres are National Forest System lands; the remainder (133,700 acres) is in other ownership, mostly private. The Forest is named for the six major rivers crossing it: Smith, Mad, Trinity, Klamath, Eel, and Van Duzen.

The Forest is transected by four east/west routes (Highways 199, 299, 96, and 36) which connect Highway 101 to Interstate 5 and the central valleys of Oregon and Northern California. These highways parallel rivers for most of their length within the Forest's boundaries, enhancing visitor access to areas known for their scenic beauty and recreational opportunities. Principal communities within the influence of the Six Rivers National Forest include Crescent City, Hiouchi, Gasquet, Orleans, Willow Creek, Hoopa, the greater Humboldt Bay area, and Garberville. The largest city is Eureka, the site of the Forest Supervisor's office, with a population of 27,025 as reported by the Census Bureau in 1990.

The Six Rivers National Forest is divided into four administrative units: Orleans Ranger District (212,120 acres), Lower Trinity Ranger District (183,670 acres), and Mad River Ranger District (230,800 acres), and the Smith River National Recreation Area (NRA) (309,750 acres). The Smith River NRA incorporates all but 21,050 acres of the former Gasquet Ranger District (330,800 acres). For administrative purposes, these 21,050 acres will be managed along with the Smith River NRA. The alternative maps show where the headquarters of each unit are.

The Forest also includes the 210-acre Humboldt Nursery in McKinleyville, California. The Yurok Experimental Forest, comprising 1,080 acres, is included in the total acreage of the Forest, but is administered by the Pacific Southwest Forest and Range Experiment Station, Redwood Sciences Laboratory, Arcata, California.

## SCOPING AND ISSUES

NEPA requires a process which includes public participation for determining the issues to be addressed and for identifying the significant or "driving" issues related to a proposed action. This process is termed "scoping." The public has been encouraged to participate in scoping throughout the planning process.

The scoping process is summarized below. Additional information on the scoping process can be found in Appendix A and in the planning records.

### SCOPING

Initial scoping began in 1979. At that time, the Forest staff held five Forest-wide public involvement (scoping) sessions and the first "Planning News" newsletter was sent out. After screening and additional public involvement, the final issues list contained 10 issues. A Draft EIS and companion Draft Forest Plan were made available for public comment in 1987.

The Forest received over 7,000 public comments in response to the 1987 Draft EIS and Forest Plan during the public response period. After analysis of the responses, three new issues were added to the list. Planning for a Final Environmental Impact Statement (FEIS) and Forest Plan then began.

The Regional Forester withdrew the 1987 Draft EIS in December 1990; the decision was documented in a Federal Register Notice dated December 12, 1990. This decision was based on two others that had been made shortly before. The first was the signing by President George Bush of the Smith River National Recreation Area (NRA) Act on November 16, 1990. Management of the Smith River NRA is dictated by the Act for this planning period. The second decision, made by the Chief of the Forest Service and published in the Federal Register on October 3, 1990, vacated the northern spotted owl management direction in the Regional Guide.

Implementation of these decisions changed the scope of, and the analysis and issues developed in, the 1987 DEIS. The December 1990 Federal Register Notice to withdraw the 1987 Draft EIS provided the public with a 30 day scoping period to verify issues raised previously and to identify additional issues. Issues brought up during this 30 day period were added to the previously identified issues and all issues were analyzed and summarized.

### DRIVING ISSUES

The Forest staff has formulated a range of alternatives in response to the issues developed during the scoping process. "Driving issues" are those issues whose resolution forces compromises between resources and shapes the land allocations and outputs for the alternatives. Managing the Forest to emphasize some resources may cause changes in others, making tradeoffs necessary. After review of all the issues raised during scoping, three issues have been deemed to be driving issues: biodiversity, timber harvest level, and management of riparian zones. These three issues are identified and discussed below. They are also identified in Table I-1, at the end of this chapter, in the order in which they are discussed in Chapters 3 and 4 of the FEIS.

**Biodiversity: How will the Forest maintain biodiversity and viable populations of all native and desirable non-native plant and animal species? Biodiversity is identified throughout the document as issue 1.**

How the Forest will manage habitat to maintain well distributed viable populations of the northern spotted owl, marbled murrelet and other threatened, endangered, candidate, or sensitive wildlife species dependent on mature and old growth forest ecosystems provides the focal point for this issue. Conserving biodiversity encompasses an array of other issues raised during the scoping period, each of which is addressed separately in the FEIS. They are wildlife, fisheries, wilderness, range, research natural areas, vegetative diversity, riparian zones, sensitive plant species; trees with special management considerations; and genetics. Although analyzed individually in this document, each issue is also a subset of biodiversity rather than a discrete entity; taken together they are regarded as components of the larger scale.

For planning purposes diversity is defined as "the distribution and abundance of different plant and animal communities and species within the area covered by the plan" [36 CFR 219.3]. Within this broad landscape level scope, diversity is examined from a series of hierarchical perspectives, involving ecosystems, communities, stands, species, and genetics.

Prevailing biodiversity concerns on the Forest include viability, distribution, and abundance of wildlife and plant populations; structure and composition of managed forests; the role of agents such as fire and insects; and the fragmentation of scarce community types. Habitat management for maintaining viable populations of the northern spotted owl, an "indicator species" (see glossary), is currently the focus of all these concerns and is briefly chronicled here.

Beginning in the early 1980s, several strategies were developed to manage for spotted owls. Much of the research available indicated that forested land exhibiting mature and old growth characteristics was necessary to maintain viable owl populations. The northern spotted owl was selected as an indicator species intended to reflect the state of health and habitat requirements for other species dependent on late seral stage (mature and old growth) structural characteristics. The 1984 Regional Guide required the Forest to establish a network of spotted owl habitat areas (SOHAs). The 1987 Draft EIS and Plan for the Six Rivers National Forest used this approach, with a network of SOHAs to provide for 48 pairs of owls. In response to comments received on the 1987 Draft EIS and Plan, the Forest dedicated 56 SOHAs ranging in size from 1,600 to 2,600 acres. Expanded streamside corridors were also developed to provide habitat connectors where necessary to tie areas together and encourage dispersal between SOHAs. All of these strategies sought to maintain biodiversity by providing habitat for species dependent on late seral stage (mature and old growth) habitat structures.

In 1989 the Forest Service responded to direction in a Congressional budget rider to commission a group of scientists from Federal land and resource management agencies to make recommendations on a strategy that would ensure the long term viability of the northern spotted owl. That committee, the Interagency Scientific Committee (ISC), published their findings in a report in April, 1990. The report recommended that specific, large areas called Habitat Conservation Areas (HCAs) be set aside. Category 1 HCAs would support subpopulations of 20 or more owl pairs and smaller category 2 HCAs anywhere from 3 to 15 pairs. The ISC report also developed a different approach called the "50-11-40" rule to tie the HCAs together. This rule required that 50 percent of all forested land outside of HCAs be managed to maintain stands of trees in which conifers have an average diameter of 11 inches or greater and conifers and hardwoods together provide at least 40 percent canopy cover.

The U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species under the Endangered Species Act in June, 1990. This listing required that owls be protected and that the U.S. Fish and Wildlife Service develop a plan to ensure recovery of the species. The U.S. Fish and Wildlife service proposed "Critical Habitat" for the owl in May, 1991, under Federal court order. This ruling added some areas to the HCAs and expanded the boundaries to match legal descriptions. The U.S. Fish and Wildlife Service issued final designations for critical habitat for the northern spotted owl on January 15, 1992, and the "Final Draft Recovery Plan for the Northern Spotted Owl" in December, 1992. The final recovery plan is expected to be published in 1995.

In 1991 a group called the Scientific Panel on Late-Successional Forest Ecosystems (also known as the "Gang of Four") was directed by Congress to develop alternatives for the management of late-successional forests on Federal lands that considered the welfare of all species of vertebrates associated with late-successional forests, at-risk fish stocks, and the

integrity of the ecosystems on which they depend. This enlarged the scope of the question surrounding the management of late-successional forests beyond that concerned with spotted owls.

The Forest Service issued the Record of Decision associated with the "Final Environmental Impact Statement on Management for the Northern Spotted Owl in the National Forests in the states of Washington, Oregon, and California" on March 3, 1992, adopting the ISC Conservation Strategy discussed above. The Forest Service was required by Judge William L. Dwyer of the U.S. District Court for the Western District of Washington to prepare a new or supplemental Environmental Impact Statement to correct deficiencies the court found in the Final EIS.

The Scientific Analysis Team (SAT) was formed by the Chief of the Forest Service to respond to the concerns expressed by Judge Dwyer regarding the Final EIS on Management for the Northern Spotted Owl in the National Forests. The SAT Report, published in March, 1993, provided viability assessments and management considerations for a wide range of species associated with late-successional and old-growth forest ecosystems in the Pacific Northwest.

To seek a solution to the controversy concerning the management of Federal lands in the Pacific Northwest, President Clinton held the Forest Conference in Portland, Oregon in April, 1993. After the conference, the Forest Ecosystem Management Assessment Team (FEMAT) was assembled to prepare an assessment that took an ecosystem approach to forest management. Using the FEMAT report, A Draft Supplemental Environmental Impact Statement (SEIS) for the Management of the Northern Spotted Owl was published in July, 1993. The Final SEIS responded to public comments and utilized new information, and was published in February 1994; the Record of Decision was published in April, 1994.

**Harvest level: What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities? This issue is identified in the FEIS as issue 2.**

Part of the mission of the Forest Service, as directed by Federal policy, is to provide a sustainable supply of raw materials to help meet the local, regional, and national demand for wood products. The Six Rivers National Forest has contributed to this mission and to the economies of the surrounding communities since the mid-1940s by making timber available for sale. The economy of Northwestern California is largely dependent on the growth and harvest of timber on private and public land, and manufacture of wood products.

The volume of timber sold annually on the Six Rivers is determined by the amount of productive land available for timber management and the intensity of management practiced on those lands. Recent changes in management direction, such as the Smith River NRA and the management strategy for the northern spotted owl, as well as injunctions on harvesting timber in suitable owl habitat, have significantly reduced the land base available for timber harvest. As a consequence the annual sale level on the Forest has declined abruptly over the last few years. The projected annual sale level in the 1987 Draft EIS was 175 million board feet (mbf); approximate sale levels for the last few years were 106 mbf (1990), 10.5 mbf (1991), and 7.9 mbf (1992). This severe decline in annual sale level has produced an adverse impact on timber-related employment opportunities in the local community.

The majority of the lands set aside have been those included in the California Wilderness Act of 1984, the Smith River National Recreation Area Act of 1990, and a variety of management schemes which have been designed to maintain a viable population of northern spotted owls and other species dependent on late-successional forest ecosystems. These actions have set aside large blocks of some of the most productive land and highest quality timber on the Forest. For those lands that currently remain available for timber management, providing a quantity of timber volume has become a driving issue.

**Management of riparian zones: How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems? This issue is identified in the FEIS as issue 3.**

The riparian zone consists of the aquatic ecosystem, the riparian ecosystem, floodplains, wetlands and ponds. Riparian zones provide habitat for aquatic, semi-aquatic and terrestrial species as well as protect water quality and stream bank stability.

Declining fish populations in the Pacific Northwest have generated concern over the quality of fish habitat and the condition of riparian zones. The Endangered Species Committee of the American Fisheries Society recently identified 214 stocks of anadromous salmonids in California, Oregon, Washington and Idaho that are in need of special management consideration because of low or declining numbers. Of these, 12 are found in habitat managed by the Six Rivers National Forest. Factors responsible for the decline of these stocks include over-exploitation in commercial and sport fisheries, habitat loss, and deleterious effects of hatchery fish and other introduced exotic species. Habitat loss, which includes decreases in the quality and quantity of available habitat and the fragmentation of habitat into isolated patches, was listed as a contributing factor for listed stocks in northern California. The maintenance and restoration of habitat to aid in the recovery of salmonid stocks has made the management of riparian zones an emerging driving issue.

## OTHER ISSUES PRESENTED

Other issues presented in this FEIS are not driving issues; they are issues whose resolution does not, as a rule, produce substantial trade-offs with other resources. Some of these issues are analyzed in detail and some are not. These issues are identified in Table I-1 at the end of this chapter, in the order in which they are discussed in Chapters 3 and 4 of the FEIS.

**Detailed Analysis of Environmental Consequences:** Issues whose resolutions lead to differences in management direction, standards and guidelines, land allocations, or environmental consequences. These issues are discussed as part of the affected environment in Chapter 3 and their environmental consequences are analyzed in detail in Chapter 4. They are identified by a plus sign (+) in Table I-1, column 1.

**No Detailed Analysis of Environmental Consequences**: Issues which provide context for other resources or management direction. They are not discriminators nor do they serve as a means to weigh the relative merits of the various alternatives. Resolution of these issues does not lead to significant differences in management direction, standards and guidelines, land allocations, or environmental consequences among alternatives. These issues are discussed as part of the affected environment in Chapter 3; they are discussed only briefly in Chapter 4. They are identified by an equal sign (=) in Table I-1, column 1.

## ISSUES NOT PRESENTED

The following issues have been legislatively or otherwise resolved and are not available as a planning option in any alternative.

The G-O Road: Should the last six miles of the G-O Road be completed?

**Resolution:** The last six miles of the Gasquet-Orleans (G-O) Road will not be completed. The G-O Road corridor was incorporated into the Siskiyou Wilderness by the Smith River National Recreation Area Act, and it will be managed as wilderness.

**Smith River:** How can the special features of the Smith River be protected?

**Resolution:** Management of this area has been determined in the Smith River National Recreation Area Act. The management plan for the Smith River NRA is Appendix A in the Draft Forest Plan.

**Global Warming:** What are the potential effects of Forest management on global warming?

**Resolution:** This issue is discussed at the national level in the USDA Resources Planning Act (RPA) Assessment and Program and the Resources Conservation Act Appraisal. The Chief of the USDA Forest Service has directed that NEPA disclosure documents at the regional, forest or project level are not appropriate means for addressing this issue at this time due to significant scientific uncertainties.

## MANAGEMENT OPPORTUNITIES

Management opportunities are suggested by both the public and Forest Service staff and, along with issues and concerns, influence the development of alternatives. Opportunities are discussed under each resource section in Chapter 3 (FEIS).

***Table I-1. Issues Analyzed in This Final Environmental Impact Statement***

These issues are identified under the section and in the order in which they are discussed in Chapters 3 and 4 of the FEIS. The detail of analysis identified in the first column is explained earlier in this chapter:
+ indicates detailed analysis in Chapter 4
= indicates no detailed analysis in Chapter 4
Also, DR indicates that the issue is a driving issue.

| | Detail of Analysis | Issue No. | Issue Statement |
|---|---|---|---|
| **PHYSICAL ENVIRONMENT** | | | |
| Geology | = | 4 | Will management activities accelerate geologic instability, and thereby degrade water quality? |
| Soils | + | 5 | How will soil productivity be maintained on logged areas? |
| Water | + | 6 | How will adverse cumulative effects on water quality be prevented? |
| Air | | | (no issues identified)) |
| **BIOLOGICAL ENVIRONMENT** | | | |
| Biological Diversity | + | 1(DR) | How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species? |
| | + | 7 | How will vegetative diversity be maintained Forest-wide? |
| | + | 8 | How will "old growth" be preserved? |
| Genetics | (see Driving Issue 1: Biological Diversity) | | |
| Sensitive Plant Species | = | 9 | How will sensitive plant populations be managed? |
| Wildlife | + | 1(DR) | (see BIOLOGICAL ENVIRONMENT: Biological Diversity) |
| | + | 10 | How will Forest Plan allocations and their respective management prescriptions affect wildlife? |
| | + | 11 | How should wildlife habitats on the Forest be managed? |
| | + | 12 | How has the ecological corridor concept been treated on the Forest? |
| Riparian Zones | + | 3(DR) | How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems? |
| Fisheries | + | 3(DR) | (see BIOLOGICAL ENVIRONMENT: Riparian Zones) |
| | + | 13 | How will the Forest maintain or improve the quality and quantity of spawning and rearing habitat? |

| | Detail of Analysis | Issue No. | Issue Statement |
|---|---|---|---|
| **SOCIAL AND ECONOMIC ENVIRONMENT** | | | |
| Social Environment | + | 1(DR) | (See BIOLOGICAL ENVIRONMENT: Biological Diversity) |
| | + | 2(DR) | (See SOCIAL & ECONOMIC ENVIRONMENT: Economic Environment) |
| | + | 17 | (See RESOURCE MANAGEMENT PROGRAMS: Heritage Resource Management) |
| | + | 36 | (See RESOURCE MANAGEMENT PROGRAMS: Special Forest Products Management) |
| Economic Environment | + | 2(DR) | What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities? |
| **RESOURCE MANAGEMENT PROGRAMS** | | | |
| Research Natural Areas | = | 14 | What areas will be recommended for establishment as Research Natural Areas? |
| Special Interest Areas | + | 15 | How will Special Interest Areas be protected? |
| Humboldt Nursery | | | (no issues identified) |
| Law Enforcement | = | 16 | How will the Forest reduce the hazard to forest users created by the illegal use of Forest land for marijuana cultivation? |
| Heritage Resource Management | + | 17 | What constitutes reasonable protection of Indian cultural activities and values? |
| Transportation and Facilities Management | + | 18 | Has the Forest considered stopping new road construction and/or decommissioning existing roads? |
| | = | 19 | Has the Forest designated existing and future utility corridors? |
| Fire and Fuels Management | + | 20 | How should the Forest manage fire to protect and improve resources? |
| Energy Resources Management | | | (no issues identified) |
| Lands Program Management | | | (no issues identified) |
| Minerals Management | = | 21 | How will the effects of mining be managed? |
| Range Management | + | 22 | How should the Forest manage the range resource? |

| | Detail of Analysis | Issue No. | Issue Statement |
|---|---|---|---|
| **RESOURCE MANAGEMENT PROGRAMS** | | | |
| Recreation Program Management | + | 23 | How much of the Forest will be opened to off-highway vehicles? |
| | + | 24 | How many miles of trails will be constructed and maintained on the Forest? |
| | + | 25 | How will more recreational opportunities be provided. |
| Roadless and Wilderness Areas | + | 26 | How should released Roadless areas (RARE II) be managed? |
| | = | 27 | How will wilderness be managed? |
| | = | 28 | Should the Forest establish additional areas for wilderness management? |
| Wild and Scenic Rivers | = | 29 | Will other rivers be assessed for inclusion in the National Wild and Scenic Rivers System? |
| | + | 30 | What will be the boundaries for the rivers in the Wild and Scenic Rivers System? |
| Timber Management | + | 2(DR) | (see SOCIAL & ECONOMIC ENVIRONMENT: Economic Environment) |
| | + | 31 | How will hardwoods be utilized? |
| | + | 7 | (see BIOLOGICAL ENVIRONMENT: Biological Diversity) |
| Trees with Special Management Consideration | = | 32 | How will the Forest protect redwood trees? |
| | = | 33 | What plan does the Forest have to ensure the maintenance of pacific yew? |
| | = | 34 | Has the Forest developed a plan to control *Phytophthora lateralis* and to maintain Port-Orford cedar? |
| Special Forest Products Management | = | 35 | How will the Forest ensure the sustainability of special forest products while providing a source of income for local communities? |
| | = | 36 | How will the Forest balance the utilization of special forest products among culturally diverse publics? |
| Pest Management | = | 37 | Under what conditions should pesticides (herbicides) be used as a Forest management tool? |
| | = | 34 | (see BIOLOGICAL ENVIRONMENT: Trees with Special Management Consideration) |
| Visual Resource Management | + | 38 | How much of the forest scenery is to appear undisturbed? |

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# ALTERNATIVES, INCLUDING THE PROPOSED ACTION

## INTRODUCTION

This chapter describes the alternatives and how they were developed. It provides background on how issues, public comment, benchmark analyses, modeling constraints, and the modeling process all function in developing alternatives. Reasons for the development of new alternatives since the 1987 draft are discussed. Appendix B contains detailed information on how each alternative was modeled during the analysis process. Also covered are how Forest-wide standards and guidelines and management area prescriptions and direction are key to the implementation of each alternative.

## DEVELOPMENT OF ALTERNATIVES

The purpose of this chapter is to describe alternative ways to respond to the issues discussed in Chapter 1. The issues, identified through public scoping, serve to focus the range and strategies of the alternatives. The alternatives differ from one another in terms of effects and the ways issues are resolved; for example, stands identified for timber harvest are also often needed for essential wildlife habitat.

The alternatives described in this chapter were formed in response to public comments on the 1987 draft, the results of scoping, and in response to legislative and policy changes affecting land use allocations. The analysis of this information revealed that three driving issues: the maintenance of biodiversity, including late-successional and old-growth forest ecosystems and their dependent wildlife species, such as the spotted owl; economic stability; and management of riparian zones dictate the overall direction of each planning alternative.

All of the five alternatives were developed by the Forest's planning team. One of the alternatives (the PRF alternative) was developed with direct input from a coalition of individuals representing local groups who proposed alternatives when commenting on the 1987 Draft. The coalition members were not obligated to represent the views or positions of their respective organizations. See Appendix F for the coalition's recommendations and how they were incorporated into the alternative. Together, the five alternatives offer a wide range of management options addressing issues presented in Chapter 1 of this FEIS.

The alternatives were developed with the aid of computer models, including FORPLAN. The models were used to help formulate an efficient and ecologically sensible combination of goods and services that fit the objectives of each alternative. Alternatives are described in terms of their levels of output, costs, and benefits.

### CHANGES SINCE THE 1987 DRAFT

Since the 1987 draft was published, a number of developments have occurred that affect land management on the Six Rivers National Forest:

1. Congressional designation of the Smith River National Recreation Area (SRNRA) in November, 1990.
2. U.S. Fish and Wildlife Service listing of the northern spotted owl and the marbled murrelet as threatened species.
3. The American Fisheries Society identification of 214 anadromous fish stocks that need special management consideration because of low or declining numbers.
4. The USFWS designation of final critical habitat for the northern spotted owl and draft critical habitat for the marbled murrelet.
5. The signing of the Record of Decision for the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (FSEIS ROD).

As a result of the designation of the Smith River NRA and the listing of the northern spotted owl, the new range of potential land uses was outside the range displayed in the 1987 Draft Plan, and the 1987 Draft Plan was withdrawn in 1990. All of these changes have significantly affected land use allocations and the types and amounts of goods and services produced on the Forest.

The Resource Planning Act (RPA) of 1990 directs the National Forests to maintain historical levels of timber outputs and provide greater emphasis in recreation, wildlife, and soil and water protection. Since enactment, the Forest's fish, wildlife, soils, watershed, and recreation programs have all received increases in funding. The recreation program has received a substantial increase in emphasis with the creation of the SRNRA. Protection for the northern spotted owl has been increased. The creation of the SRNRA and the designation of large habitat blocks for the northern spotted owl has reduced the Forest's timber suited land base considerably, thereby reducing the Forest's sustainable harvest capacity to well below the historical timber sale level.

### UNRESOLVED, CONCURRENT ISSUES

Several issues are continuing to evolve during the Forest's planning process. They include:

1. designation of final critical habitat for the marbled murrelet
2. development of a final recovery plan for the northern spotted owl
3. development of a final recovery plan for the marbled murrelet
4. potential listing of several species of pacific salmonids.

Each of these issues has the potential to affect the outcome of the planning process. This FEIS addresses these issues by providing alternatives that encompass the range of potential outcomes and assessing the effects of each. By analyzing the range of foreseeable consequences, this FEIS strives to provide the decision maker with sufficient information to allow for an informed modification of the selected alternative, should it become necessary. Otherwise, if the changes have consequences outside the range of alternatives analyzed, the Plan could be modified by revision or amendment (See Chapter 5 of the accompanying Land and Resource Management Plan for a discussion of these options).

## BENCHMARKS

Benchmarks are a series of FORPLAN computer runs that are used to analyze resource and economic production capabilities on the Forest. Benchmarks provide an analytical base for development of alternatives, as well as a reference point for their comparison, and help in assessing current resource condition and potential. Benchmark analyses help to determine the extreme limits of resource capabilities on the Forest by setting the upper and lower bounds of outputs for all alternatives. In order to display capabilities and extremes, benchmark values cannot be constrained by Forest Service budget, feasibility, or program and staffing requirements; hence they are usually not implementable.

Benchmarks provide information on the following:

1. The economic implications of complying with legal and policy constraints, including the management requirements of 36 CFR 219.27.
2. The effects of modeling assumptions.
3. Physical, ecological, and technical constraints and capabilities.
4. The schedule of management activities, resource outputs, effects, costs, and present net value (PNV) associated with a single resource or an economic emphasis of individual benchmarks.
5. The potential to resolve issues and concerns.
6. The range within which integrated management alternatives may be developed.

### BENCHMARK ANALYSES

The benchmark analyses performed to facilitate the development of alternatives include:

#### Minimum Level Management (MLV)

Determines the cost necessary to redeem responsibilities which are necessary to protect life, health, and safety of users, maintain populations of threatened and endangered species, or prevent environmental damage. This benchmark produces no marketable outputs.

#### Maximum Present Net Value (FLW)

Manages the Forest to maximize PNV in the most unconstrained manner possible. Timber policy constraints, minimum management requirements (MMRs) and minimum implementation requirements (MIRs) do not apply. A $\pm$15 percent departure from non-declining, even-flow timber harvest is allowed per period, without which the model would harvest all available timber in the first decade. The purpose of this analysis is to determine the costs of imposing further constraints in the development of alternatives.

## Minimum Management Requirements (MMR)

Manages the Forest in a manner which maximizes PNV using both market and assigned values for all scheduled outputs, subject to MMRs and timber policy constraints.

## Minimum Management Requirements with Market Values (MKV)

Manages the Forest in a manner which maximizes PNV using only those outputs which have established market values, such as timber, range or developed recreation.

## Maximum Timber Production for One Decade (TBR)

Defines the maximum possible timber output for the first decade, assuming the use of MMRs and non-declining sustained yield.

## Maximum Timber Production with Departure (TBD)

Defines the maximum possible timber output for the first decade without the constraint of non-declining yields. The timber harvest flow is restricted to ±15 percent of the previous decade's harvest level, and is not allowed to fall below the long-term sustained yield potential of the land base.

## Maximum Wilderness (WLN)

Demonstrates the consequences of recommending the Forest's remaining roadless areas for wilderness (See Appendix C for descriptions of roadless areas). The objective function is to maximize PNV.

## Maximize Range Production for Five Decades (RGN)

Defines the maximum utilizable livestock forage for the first five decades. This benchmark would convert identified transitory range to permanent grassland and would harvest timber at minimum rotations to produce additional forage on other lands. This approach would produce forage to support 20,000 AUMs. This output of forage would exceed current and expected demand and would be located in areas not now managed for grazing (i.e, in the northern part of the Forest).

## Maximize Water Production (H2O)

Defines the maximum amount of water the Forest could produce (it is the same management scheme as the RGN benchmark). To model this benchmark, all timber lands that could be converted to permanent grasslands are converted, and all other timber lands are managed for minimum rotations. The results of this analysis show that the Forest can only cause a change of less than 2 percent in water yields over normally-occurring background yields.

## Conclusions

The conclusions reached as a result of the benchmark analyses are:

1. Timber values account for the majority of the PNV.

2. The constraint which results in the greatest reduction in PNV is the requirement to maintain viable and diverse populations of plant and animal species.

3. The FORPLAN solutions to the MMR and MKV benchmarks were identical in terms of land allocations and outputs, but the PNV for the MMR benchmark was higher due to the inclusion of non-market benefit values. This indicates a complementary relationship between market and nonmarket outputs when minimum management requirements are applied.

4. All of the benchmarks except MLV and FLW are similar in terms of PNV, primarily because they share the same land base and essentially the same management techniques. When viewed over the 150-year planning horizon, the unique elements of each benchmark lose their significance.

Table II-1 contains a summary of benchmark outputs and activities. See Appendix B for a detailed explanation of the benchmarks.

**!!! insert Table II-1 around here !!!** (Marlette, we don't have this table yet, but it will be 2 pages long).

# ALTERNATIVES NOT CARRIED FORWARD

## ALTERNATIVES FROM THE 1987 DRAFT

Eight alternatives from the 1987 draft Forest EIS were considered but not carried forward in this FEIS. They are summarized below:

**PRF Alternative:** Emphasize timber, fisheries, and dispersed recreation. Produce moderate levels of timber, anadromous fish, and a full range of dispersed recreation opportunities. Produce moderate amounts of other goods and services.

**CUR Alternative:** Current (as of 1987). Manage Forest based on current plans, S&Gs, laws, regulations, and policies.

**RPP Alternative:** RPA Program. Best implement the Forest share of the 1980 RPA targets as assigned by the Region.

**PFD Alternative:** Preferred, with departure. Same as PRF, but with a timber harvest departure.

**NMK Alternative:** Non-market values. Provide high levels of non-market services, and values. Also produce marketable outputs at economically efficient levels on lands not constrained by this alternative.

**WLF Alternative:** Wildlife emphasis. More closely reflect natural vegetative processes in forest management practices. Emphasize maintenance of all wildlife species, vegetative diversity, watershed stability, and anadromous fish habitat. Provide low levels of other goods and services.

**LOW Alternative:** Manage the Forest in a manner that requires little capital investment, reduce budget to 75 percent of FY 82 levels. Maintain existing facilities.

**DFG Alternative:** Fish and wildlife resources. Provide more late successional habitat and greater wildlife emphasis for fish and wildlife resources (developed in response to a California Department of Fish and Game proposal).

Since the 1987 draft was published, Congress designated the majority of the Gasquet Ranger District as the Smith River NRA, and the northern spotted owl was listed as a threatened species. Because the effect of these two events was outside the range of the alternatives displayed in the 1987 draft, the draft was withdrawn in December, 1990, and the 1987 alternatives are not carried forward in this document.

## OTHER ALTERNATIVES

Since the withdrawal of the 1987 draft, seven alternatives have been developed to respond to the issues. Each of the alternatives was modeled in FORPLAN to determine its levels of activities and outputs. Two alternatives were eliminated from detailed study. They are summarized here, along with the reasons why no further consideration is appropriate. The other five alternatives were studied in detail, and are described in the following section of this chapter.

**SOH Alternative:** Emphasize timber, fisheries and developed recreation. Use the SOHA network for maintaining habitat for the northern spotted owl. Manage the Smith River NRA as directed in the Smith River National Recreation Area Management Act. This alternative was eliminated from further consideration after the Regional Guide was amended by the northern spotted owl EIS decision of March, 1992.

**PFD Alternative:** Preferred alternative, with departure. This alternative is the same as PRF, but with a timber harvest departure. The departure was modeled in FORPLAN by relaxing the non-declining flow constraint. The FORPLAN analysis determined that the timber harvest level was only able to depart 0.5 mmbf due to the limited amount of land available for timber harvest. Because the harvest levels in PRF and PFD are essentially the same, the PFD alternative was eliminated from further consideration.

# ALTERNATIVES CONSIDERED IN DETAIL

## MANAGEMENT REQUIREMENTS AND CONSTRAINTS FOR ALL ALTERNATIVES

Seven types of constraints are common to all alternatives:

1. Minimum management requirements (MMRs),
2. Timber policy constraints,
.3. Minimum implementation requirements (MIRs),
4. Regional herbicide policy,
5. Forest-specific modeling constraints,
6. Forest-wide standards and guidelines
7. Smith River National Recreation Area
8. Management area direction.

Specific guidelines for evaluating Forest Plan EIS alternatives are provided in 36 CFR 219, Land and Resource Management Plans in Implementation of the National Forest Management Act of 1976. These seven categories are described briefly below.

### 1. Minimum Management Requirements (MMRs)

These requirements represent the absolute minimum necessary constraints, and are used to provide consistency of analysis between forests. MMRs are the minimum specific management requirements to be met in accomplishing goals and objectives for the National Forest System and are established in the regulations implementing NFMA. The MMRs are not discretionary in the Forest planning process. See Land Management Planning Direction, Pacific Southwest Region (USDA 1981a) for more detailed discussions, and Appendix B for how the MMRs were used in the modeling and analysis process. The MMRs are summarized below:

**Determination of lands suitable for timber production:** Lands suitable for timber production are those lands which: 1) are or were forested; 2) are not Congressionally or administratively withdrawn from timber production; 3) can be managed for timber without any irreversible damage to soil productivity or watershed conditions; 4) can reasonably be assured to be adequately restocked within five years of final harvest; and 5) have adequate information available to project responses to timber management activities. Figure II-1 outlines the process for identifying lands suited for timber production.

**Threatened and endangered species:** Identify habitat that is critical for threatened and endangered species and prescribe measures to prevent the destruction or adverse modification of this habitat. Manage the Forest to provide high and medium quality habitat sufficient for recovery of these species, including currently occupied habitat and potential habitat as necessary. The only threatened and endangered species known to exist on or near the Forest are the bald eagle, peregrine falcon, northern spotted owl and marbled murrelet. Threatened and endangered species population targets, assigned to the Forest as portions of species' overall recovery goals, are four pairs for bald eagles and seven pairs for peregrine falcons.

**Viable populations:** Manage vertebrate species to ensure that viable populations are maintained. Habitat must be distributed in a manner that will provide for interaction between individuals. For the northern goshawk, maintain a network of 55 territories in forested habitat across the Forest.

**Diversity of plant and animal communities:** Provide a threshold level of vegetative types and seral stages found within the Forest to insure at least a minimum level of diversity for plant and animal communities. This minimum is established as 5 percent of the Forest in each vegetative type in each seral stage, as per the Pacific Southwest Regional Guide (1984).

**Riparian zones:** Protect streams, streambanks, shorelines, lakes, and wetlands and their dependent plants and animals.

**Soil and water productivity:** Conserve soil and water resources. Maintain water quality and its beneficial uses, maintain the productive capacity of all Forest soils.

## 2. Timber Policy Constraints

Timber policy constraints are needed to insure that timber harvest levels meet sustained yield, harvest occurs at culmination of mean annual increment (CMAI), and harvest areas are sufficiently dispersed. They are:

a. Assure that all even-age stands scheduled for final harvest will have reached at least 95 percent of CMAI.

b. Provide a range of rotation ages.

c. Insure that long-term sustained yield, as defined for each alternative, is perpetuated through the end of the planning horizon.

d. Prevent regeneration units that are still considered "openings" from having more than 15 percent of their boundaries in common with other openings, as specified in the Regional Guide. Disperse units in such a way as to leave logical harvest units between openings.

## 3. Minimum Implementation Requirements (MIRs)

These requirements establish minimally acceptable levels of implementation that all alternatives must meet. Generally, these requirements are within agency control, but there is little discretionary control at the Forest level regarding application of these requirements on the ground. In summary, the MIRs are: 1) manage sensitive plants to ensure that species do not become threatened or endangered as a result of Forest Service actions, and 2) maintain visual quality of the foreground and middleground of highways 299, 36, 96 and Highway 199 to partial retention standards. For more detailed discussions, see Land Management Planning Direction, Pacific Southwest Region (USDA 1981a); also see Appendix B for how the MIRs were used in the modeling and analysis process.

## 4. Regional Herbicide Policy

In March 1989, the Pacific Southwest Region of the USDA-Forest Service issued a Final Environmental Impact Statement (FEIS) titled "Vegetation Management for Reforestation." It included detailed discussions and analyses of a preferred alternative (continuation of the current policy), alternatives to the preferred (including no vegetation management, no application of herbicides, and no aerial application of herbicides), and the consequences of these alternatives on the environment. Based on the preferred alternative in the vegetation management FEIS, all alternatives in this FEIS (except ECR) are predicated on the continued use of a full range of vegetative treatments. The Forest Plan directs that: 1) the selection of any particular treatment method will be made at the project level based on site-specific analysis of the relative effectiveness, environmental effects, and costs of the feasible alternatives, and that herbicides will be selected only if their use is essential to meet management objectives; and 2) monitoring and enforcement plans to implement specific measures will be developed for site-specific projects and described in the environmental analyses for these projects.

Except for the ECR Alternative, all alternatives in this FEIS assume continued use of the full range of vegetative management methods for reforestation and timber stand improvement, including mechanical, biological, chemical, and prescribed fire methods. If the current policy on the use of herbicides were to change to either restrict or prohibit their use, the timber yield and vegetative management (site preparation and release) costs could vary for some of the alternatives presented here.

## 5. Forest-Specific Modeling Constraints

The following modeling constraints are common to all alternatives unless specifically noted.

**Smith River National Recreation Area:** Each alternative incorporates the direction contained in the Smith River National Recreation Area legislation. No changes to this legislation are proposed in any alternative.

**Native American Contemporary Use Areas:** The Blue Creek Unit Plan administrative review (Chief of the Forest Service Max Peterson, November 17, 1981) identified 11 cultural sites that needed protection. Five of these sites were included in the extension of the Siskiyou Wilderness and require no further designation to ensure their protection. Three sites were additionally added to the Siskiyou wilderness in the Smith River National Recreation Area legislation when the G-O Road corridor was designated as wilderness. The remaining three sites have been removed from the timber land base. See the NACUA management direction for additional information.

**Wilderness:** Areas designated as wilderness (123,150 acres) are common to all alternatives because of the direction in the California Wilderness Act of 1984 regarding wilderness analysis during this round of planning (see Chapter III, "Wilderness," for further discussion).

**Silvicultural Strategies and Timber Yields:** Each alternative proposes a different mix of silvicultural strategies used to manage the timber regulated land base. Timber yield estimates for each strategy were used to project the Allowable Sale Quantity for each alternative. The effect of green tree retention within regeneration areas is included in yield projections. Silvicultural strategies and yield levels for given management areas vary by alternative, and are as follows:

Silvicultural Strategy 1/full yield: Based on the long term sustained yield capacity (maximum board foot yield), derived from projections of even-age management with regeneration harvest occurring at no earlier than 95% of culmination of mean annual increment. This equates to an average stand replacement rate of 10% per decade.

Silvicultural Strategy 2/reduced yield: 80% of full yield, 8% per decade stand replacement rate.

Silvicultural Strategy 3/marginal yield: 30% of full yield, 3% per decade stand replacement rate.

Silvicultural Strategy 4/no regulated yield: No regulated harvest will come from these areas.

Silvicultural Strategy 5/greatly reduced yield: 60% of full yield, 4% to 8% per decade stand replacement rate.

Silvicultural Strategy 6/minimal yield: 20% of full yield, 2% per decade stand replacement rate.

Descriptions of each silvicultural strategy are contained in Appendix B.

**Range Management Strategies:** Each alternative proposes different strategies and levels of intensity for range management, based on the goals of the alternative. The range management strategies are described below.

Range Strategy 1: Management excludes grazing to protect other resource values or eliminate conflicts with other uses.

Range Strategy 2: Management controls livestock numbers so that proper range use is not exceeded on primary range. Improvements are minimal and constructed only to the extent needed to protect and maintain the range resource.

Range Strategy 3: Management seeks to optimize utilization of existing forage production which is available to livestock. Cost-effective management techniques such as structural range improvements and grazing systems are designed and applied to obtain relatively uniform livestock distribution, use of existing forage production on both primary and secondary range, maintenance of plant vigor, and achievement of associated resource objectives.

Range Strategy 4: Management seeks to optimize production and utilization of forage available for livestock, consistent with maintaining the environment and providing for multiple uses of rangeland ecosystems. Nonstructural range improvements such as brush control, type conversion, or seeding may be used to increase forage production; such practices may be used in combination with fencing and water developments to implement complex grazing systems.

Range Strategy 5: Management seeks to maximize livestock production while maintaining basic soil and water values. Cost-effective management systems and techniques are used to achieve this goal. Multiple use is not a constraint.

## 6. Forest-Wide Standards and Guidelines

In addition to the above, the Six Rivers National Forest has developed Forest standards and guidelines to assure efficient and ecologically based management of Forest resources. A summary of the standards and guidelines that apply to all alternatives follows. (See Chapter 4 of the Plan for the complete set of standards and guidelines that define the Preferred Alternative).

Standards and guidelines and management area direction are central to Forest Plan implementation and monitoring. Additional discussion of the monitoring strategy and the function of S&Gs and management area direction can be found in Chapters 4 and 5 of the Land and Resource Management Plan.

**Physical Environment**

**Geology, Soils and Watershed Management:** The primary management goal is maintenance of long-term soil productivity.

Identify geologic hazards and minimize the impacts from management activities on streams and facilities.

Plan and conduct all forest management activities to maintain existing water quality or where degraded, restore water quality to meet State water quality standards for the North Coast Region.

Maintain the integrity of watersheds and riparian ecosystems, including riparian areas, for the protection or enhancement of riparian-dependent resources.

**Air Quality:** Maintain air quality adequate for the protection and use of the National Forest resources and meet or exceed applicable Federal and State standards and regulations.

**Biological Environment**

**Vegetation Management:** Provide vegetative diversity to maintain viable plant and wildlife populations, to minimize loss from fire, and to maintain scenic quality.

Provide a sustained quantity of forest products by selecting silvicultural practices from the full range available on an individual stand basis, in accordance with biological requirements, economic efficiency, and Forest Goals for other resources.

**Sensitive Plant Species:** Develop an understanding of plant ecosystems and apply that knowledge in resource management activities.

Ensure that Forest management actions maintain endangered, threatened or sensitive plant species or their habitat.

**Aquatic and Riparian Resource Management:** Maintain fish habitat for all species during the implementation and management of other resource activities.

Provide diverse, high quality fish habitat capable of maintaining or enhancing populations and stocks of fish at risk. Follow direction outlined in the US Forest Service Pacific Salmon and Steelhead Trout Strategy (PACFISH).

Maintain riparian dependent resources (water, fish, wildlife, riparian-related aesthetics, and aquatic vegetation).

Manage riparian zones to maintain water quality; stream temperature; stream bank stability; wildlife habitat, connectors, and corridors; and to retain sources of large woody debris for habitat structure and channel stability.

**Wildlife Resource Management:** Maintain viable populations of all native and desirable non-native wildlife species occurring on the Forest by providing the variety, distribution, and amount of wildlife habitat types necessary, and maintaining a biologically diverse and functional forest landscape ecosystem. The Forest will focus on this goal through the monitoring and protection of selected Management Indicator Species (MIS), whose population status and trends are assumed to reflect: 1) the overall health and integrity of their respective biotic assemblage or community as a whole, and 2) community-level responses to management related disturbances.

Maintain or improve populations of endangered, threatened, and sensitive species by providing suitable habitats that are capable of meeting species requirements.

**Social and Economic Environment**

**Native American Trust Responsibility:** Further the governmental relationship with Federally recognized Tribal governments.

Facilitate access and use of National Forest System lands by Native Americans.

**Resource Management Programs**

**Heritage Resources:** Identify, evaluate, and provide for public appreciation of heritage resources on National Forest lands.

Recognize the contemporary values of the American Indians who use the Forest and provide positive resolution where other resource uses conflict with those values.

**Transportation and Facilities:** Provide public access to National Forest lands for the use and enjoyment of its natural resources.

Provide a safe, efficient and cost-effective transportation system.

Provide access for the physically challenged to a wide variety of Forest Service programs, services and activities.

Provide safe, functionally efficient and aesthetically pleasing facilities to support the Forest programs.

**Fire/Fuels Management:** Provide well-planned and well-executed fire protection and fuel treatment programs (including prescribed burns) that are responsive to land, resource and cultural management objectives.

**Lands:** Reduce land management problems and minimize conflicts between uses of National Forest System and adjacent private lands.

Actively pursue and eliminate illegal occupancy and use.

**Minerals:** Manage National Forest System lands that are not withdrawn from mineral entry to encourage and facilitate the exploration, development and production of mineral resources while ensuring that these activities are integrated with the use and protection of other resources.

**Range:** Maintain the biologic diversity of rangeland ecosystems, and protect fish and wildlife resources. Maintain rangeland productivity on suitable rangelands while providing forage for livestock production consistent with demand and other resource values and uses.

**Recreation:** Provide a wide range of quality outdoor recreation opportunities, emphasizing the unique character of the Six Rivers by furnishing different levels of access, services, facilities, and information necessary to meet public demand.

Fully implement the National Recreation Strategy through the development of partnerships with local governments, state, other federal agencies, and other groups and individuals. Support local economic development strategies that focus on increased recreation and tourism.

Improve customer service and enhance user enjoyment through quality interpretive and visitor information that interpret forest resources and management.

Provide quality wild, scenic and recreational river opportunities along designated rivers, based on the values for which they were designated under the Wild and Scenic Rivers Act.

Maintain wilderness to preserve its wilderness character while providing opportunities for a quality wilderness experience.

Develop designated OHV routes on existing roads and trails, and expand OHV use by creating partnerships with user groups.

**Special Forest Products:** Provide various forest products to meet public demands. Ensure that utilization is carried out in a manner and at a level that will provide a sustained level of outputs. Examples of products supplied by the Forest include: softwood and hardwood sawlogs and chip logs, personal use fuelwood, hardwood burls, cones and hardwood seed, boughs, beargrass, pacific yew, Christmas trees, fence posts and poles, mushrooms, moss, and various other ornamental and medicinal plants.

**Pests:** Minimize resource damage from insects, disease, plants (weeds) and animals through integrated pest management. The phrase “integrated pest management” is used in this

document to describe a decision making and action process which incorporates biological, economic, and environmental evaluation of pest-host systems to manage pest populations and reduce resource damage.

**Visual Quality:** Manage Forest lands to achieve visual quality commensurate with public uses.

## 7. Smith River NRA Direction

The Smith River National Recreation Area Act was signed by President George Bush on November 16, 1990. This Act established the 305,000 acre NRA, divided it into eight management areas, and set general policy for each area. The Act required the development of a NRA Plan with detailed direction for the management of the NRA as well as the wild and scenic rivers within the NRA. The NRA Management Plan was approved in August, 1992 and is attached as Appendix A of the accompanying Plan.

The Act provided that the NRA Management Plan would satisfy the requirement for a comprehensive wild and scenic rivers management plan for the designated segments within the NRA. Although the wild and scenic river corridor boundaries identified in the NRA Management Plan were considered during legislation, legislative history shows that the intent is that the boundaries of the designated segments be established through the process prescribed under the Wild and Scenic Rivers Act. Therefore, the Forest is establishing the corridor boundaries through this document.

For all designated segments, the corridor boundaries identified in the NRA Management Plan coincide with the streamside protection zones which were established in the NRA Act. The zones extend from 300' from each bank for some recreational segments to 1/4 mile for other recreational segments as well as all wild and scenic segments; timber harvest is prohibited within these streamside protection zones. As the zones were established for the protection of the designated segments within the NRA, the wild and scenic river boundaries identified in the NRA Management Plan meet the intent of the NRA Act and are common to all alternatives. For those areas excluded from the National Recreation Area, the boundaries for all wild and scenic rivers segments will be the high water mark.

## 8. Management Area Direction

For each alternative, the Forest is divided into an array of management areas. Management areas consist of broad categories of lands with common resource emphasis or concerns. Management area direction determines specifically how each management area is treated, what practices are permitted, and what goods and services are produced. Most management area direction was developed to clarify existing Forest Service direction for the particular resource area involved or to help implement acts or laws establishing certain designated areas.

Management area direction does not change by alternative, but the number of acres and timber yields for each management area may vary. In some alternatives, certain management areas will not exist. Management direction is not dynamic, but is intended to serve as a fixed management goal, and can only be altered through Forest Plan amendment, which requires public involvement in the decision process.

Management direction legislated by the Smith River National Recreation Area Act of November 16, 1990, is incorporated directly into this FEIS. Since the direction was legislated by Congress, it is not subject to appeal or amendment in the current planning round specific to this document. The NRA management direction is included to provide context for comparison to other management direction in each alternative. Appendix A of the accompanying Forest Plan contains the legislation and adopted management plan for the NRA.

The Six Rivers National Forest has been subdivided into 17 management areas. Management areas and their direction are summarized below. Any given acre of land can be in only one management area. When an area of land could be included in two or more management areas, a management area priority is needed. Each management area is given an application priority based on the types of activities permitted. Management areas which are the most restrictive in terms of allowed activities are applied first. By using this process, an area of land that could be included in two or more management areas is included in the management area with more restrictions. The management area

application priority for each alternative is shown in Tables II-2, II-4, II-6, II-8, and II-10.

A detailed description of management area goals, objectives and standards and guidelines can be found in Chapter 4 of the Plan.

**Management Area 1 - Wilderness**

This management area includes lands that have been designated by Congress as wilderness. Wildernesses are managed according to the Wilderness Act of 1964, the California Wilderness Act of 1984, and regulations pursuant to those acts. Wilderness will be managed to minimize human thechnology and its impacts upon wilderness resources. People will be temporary visitors who leave no permanent imprint of their use. Manipulation of flora, fauna, or the surface of the land alters the wilderness resource and will be allowed only to the extent necessary to meet conditions of the Wilderness Act. Management will seek to preserve spontaneity of use and as much freedom from regimentation as possible while preserving wilderness resources. To the extent the wilderness resource is not impaired, wilderness will be managed to provide opportunities for primitive recreation featuring solitude and physical and mental challenges. Most of the area will be essentially unmodified, with large areas between the trails in which the likelihood of solitude will be very high.

The users will find a natural landscape accessible by trails or cross-country travel. The natural processes of plants and animals living and dying with minimal impacts from humans will be evident.

**Management Area 2 - Wild River**

This management area is applicable to those “wild” segments of the Smith, Trinity, and Eel Rivers which were petitioned by the Governor of California and added under Secretary Andrus’ signature under Section 2 (a)(ii) of the Wild and Scenic Rivers Act and those rivers designated under the Smith River National Recreation Area. The goal is to maintain the river environment in a natural state for anadromous fisheries while providing for recreation opportunities such as white water rafting and kayaking. Although the rivers are designated “wild”, the character of each is significantly unique and consequently management objectives for each river may differ. The wild designation was reserved for those rivers that are free-flowing and generally inaccessible except by trail. The natural state of the wild rivers within the Forest boundary will be maintained. Impacts due to river-related recreation will be monitored.

The corridors for the wild river segments do not vary for the Smith and Trinity River segments, but vary for the Eel River. Wild rivers within the SRNRA will be managed under direction provided by the founding legislation and management plan.

Wild river segments on the Lower South Fork of the Trinity will be managed under direction provided by the Lower South Fork Trinity Wild and Scenic River Management Plan.

**Management Area 3 - Yurok Experimental Forest**

The primary goal of this management area is to provide an area for the study of structure and function in the Redwood forest ecosystem. This area is managed by the Pacific Southwest Forest and Range Experiment Station. The Yurok Experimental Forest is composed of a pure redwood stand that has been partially converted to second growth. Within the Experimental Forest is the 180 acre Yurok Research Natural Area, which has been reserved to study old-growth redwood. This management area occurs within a spotted owl critical habitat area designated by the USFWS. This mature and old growth redwood forest also provides habitat for marbled murrelets, which was recently listed as a threatened species. This area will be managed to provide mature and old growth redwood forest, that contribute to the habitat needs of threatened wildlife species that occur in the redwood forest type.

The Pacific Southwest Forest and Range Experiment Station staff will write a study plan for all projects and will prepare the appropriate NEPA documentation with supporting biological evaluations, for all future logging activities involving old-growth redwood.

All environmental laws and regulations that apply to the Forest also apply to management of the Experimental Forest.

**Management Area 4 - Humboldt Nursery**

The mission of Humboldt Nursery is to grow tree seedlings which will be used to reforest Federal and State lands in northern California and southern Oregon. It is an administrative subunit of the Forest composed of 210 acres of Forest Service land located north of McKinleyville, Humboldt County, California. The Nursery is on purchased lands which are closed to mineral entry. Established in 1964, it has a capacity to

produce 20,000,000 seedlings annually, with actual production levels depending on demand. Douglas-fir comprises 95% of the species grown, with the other 5 percent being ponderosa pine, Jeffrey pine, red and white fir, noble fir, grand fir, western hemlock, Sitka spruce, western red-cedar, incense cedar, alder and redwood. Nursery operations involve seed preparation, sowing, culturing, genetics, harvesting, grading, packing, tree storage, and shipping. Integrated in these activities are soil management, pest management and administrative studies of effectiveness of nursery practices and cultural methods.

**Management Area 5 - Research Natural Areas**

Research Natural Areas (RNAs) are part of a national network of field ecological areas designated for non-manipulative research, observation, and to study and maintain biological diversity on National Forest System lands. The goal is preservation of naturally occurring physical and biological units for the purposes of: 1) comparison with those lands influenced by humans, 2) ecological and environmental studies, and 3) preservation of gene pools for typical and rare and endangered plants and animals. RNAs are removed from the timber land base, and are not designated for recreational use or other forms of resource management. RNAs may serve as education and research sites on plant and animal communities, and may also help to implement provisions of special acts, such as the Endangered Species Act and the monitoring provisions of the National Forest Management Act. Research should be limited to non-consumptive, non-destructive, and essentially observational activities. Collecting soil, plants, or animal specimens (with California state collecting permits) may be permitted on a case-by-case basis.

Although the Yurok RNA has been established on the Forest (within the Experimental Forest), it is not included in this management area because it is managed by the Pacific Southwest Forest and Range Experiment Station. All research proposals will be approved by the PSW Station Director.

**Management Area 6 - Native American Contemporary Use Area (NACUA)**

The need for the designation of NACUAs was identified specifically on the Forest for 11 cultural sites as a result of the Blue Creek Unit Plan administrative review decision by Forest Service Chief Max Peterson (11-17-81). These NACUA sites are preserved and protected for the solitude and privacy of Native American users. The sites have been included in the Helkau District which is eligible for the National Register of Historic Places. Established is a one-half mile radius protective zone to minimize potential for conflicts between recreation and Native American spiritual uses around each of the following cultural sites: 1) Dr. Rock #1, 2) Peak 8, 3) Bad Place, 4) Chimney Rock, 5) South Red Mountain #1, 6) South Red Mountain #2, 7) Dr. Rock #2, 8) Meadow Seat, 9) Classic Prayer Seat, and 10) Turtle Rock. Also, a one-quarter mile wide protective zone was established along the Golden Stairs Trail from the Forest boundary to Road 15N01. Other dispersed recreation uses of the areas are not prohibited, and will undoubtedly occur, but this use will be secondary to the intent for the establishment of this management area.

**Management Area 7 - Smith River National Recreation Area**

The SRNRA was established in December of 1990, by SB 2566/HB 4309. The SRNRA is managed under direction provided by eight management areas. The primary goals are to emphasize, protect, and enhance the unique biological diversity; anadromous fisheries; and the wild, scenic, and recreational potential of the Smith River while providing sustained yields of forest products. See Smith River NRA Plan (Appendix A of the Plan) for additional information.

**Management Area 8 - Special Habitat**

This management area is intended to provide a core of habitat for plants and animals associated with mature and old-growth forests. This management area contributes to the networks described in managed habitat (Management Area 14); but also provides additional protection of nest zones for bald eagle, peregrine falcon, habitat for the northern spotted owl, and in some alternatives, habitat for the northern goshawk and marten. Vegetative manipulation to enhance the value of stands for wildlife may occur in this area.

Characteristics of individual areas will vary somewhat according to the indicator species for which they are managed. Although individual mature and old-growth stands may survive for many decades, these habitat areas will not provide suitable conditions indefinitely, and may require management towards an uneven-aged condition, or finding substitute areas in other parts of the Forest.

**Management Area 9 - Riparian Reserves**

Riparian ecosystems are physical-biological systems in or near surface waters that have primary values associated with water and the proximity of land to water. Riparian ecosystems include terrestrial, semi-aquatic (land/water interface) and aquatic components and habitats.

The Riparian Reserve Management Area will contain stands of large conifers and hardwoods with mature and old-growth habitat characteristics to provide a perpetual source of large organic debris for the maintenance of instream stream fish habitat, nutrient supply, and channel stability. This management area will also provide shade, food inputs from leaf fall and insects, and large organic debris providing wildlife habitat and habitat for micro-organisms important for soil productivity.

**Management Area 10 - Special Interest Areas**

These areas are managed to maintain their unique botanical and geological values for public use and enjoyment. Botanical areas are managed for educational and recreational use while protecting important botanical resources. They include the best representations on the Forest of unusual plants indigenous to northwestern California. Geologic interest areas display interesting and unique geological features on the Forest. Further descriptions and more detailed maps are on file in the Forest Supervisor's Office in Eureka.

**Management Area 11 - Special Regeneration**

Some areas of the Forest meet all National Forest Management Area criteria for timber suitability, but would require extremely high investments for successful regeneration within five years of harvest. These are areas with 8" to 24" of rock on the surface, but good soil below the rock, or areas with relatively low conifer productivity that support dense stands of mature hardwoods. Low sites, including ultramafic soils with poor conifer stocking, make up a large part of this Management Area. Site specific evaluation will indicate which areas with low site productivity or areas with extremely rocky surfaces are not suitable for investment of funds to produce timber products. Those areas that are entered for timber management purposes will be regenerated with conifer species suitable for the site and capable of surviving in the harsh conditions present. The prescription should take into account regeneration sources, pest damage, current and potential stand growth/yield and regeneration costs.

In the Forest database, areas coded "soil groups 4 and 5" with poor conifer stocking were included in this management area.

**Management Area 12 - Scenic River**

This prescription applies to segments of the Trinity and Smith Rivers and adjacent corridors of land classified as "scenic" under the National Wild and Scenic Rivers Act of 1968 and designated by the Secretary of the Interior on January 19, 1981. Scenic rivers have high scenic quality and largely undeveloped shoreline, and are free of impoundments and accessible in places by roads. The goal is to maintain and provide outdoor recreation opportunities in a predominately natural setting. The basic distinctions between a "wild" and a "scenic" river area are degree of development, type of land use and road accessibility. Scenic river segments will appear to be in a natural forest condition as seen from the river. This management direction applies to the corridors on each side of scenic river segments (the scenic river corridor widths vary by alternative). Actual management area boundaries and desired future conditions will be identified in individual river management plans, except for: 1) the scenic river corridors in the SRNRA which have been identified in the SRNRA Management Plan; and 2) the scenic river segments on the Lower South Fork of the Trinity River which have been established through the Lower South Fork Trinity Wild and Scenic River Management Plan.

**Management Area 13 - Retention Visual Quality Objective (VQO)**

The primary goal of this management area is to maintain the area in a condition that appears undisturbed. The area has multiple use goals which include the maintenance of mature conifer, deciduous mixed evergreen, mature riparian and grass-forb wildlife habitats, and the protection of watershed resources. Viewsheds with the VQO of retention will have an undisturbed appearance as seen from the viewing location. Although the quality of the scenery from the viewing locations may be affected by activities on private lands, the direction for this management area applies only to National Forest Lands.

Most management activities are acceptable, considered on a project-by-project basis, and would be designed according to the retention objectives of the visual management system. The character of the landscape

may change over time, but each project would not be visually apparent.

**Management Area 14 - Managed Habitat**

Managed Habitat Areas are intended to maintain and enhance habitat for a broad range of species dependent on structural features common to late-successional vegetation within the context of compatible timber management. Networks are provided for management indicator species such as fisher, marten, northern goshawk and spotted owl. These designated habitat areas are well distributed throughout the Forest. This management area, together with mature and old-growth forest habitats maintained in Riparian Reserve, Wild River, Special Habitat and Wilderness Management Areas, will provide habitat throughout the Forest in order to contribute to the maintenance of viability for wildlife species dependent on mature and late-successional forest conditions.

Wildlife habitat networks are designated to provide well distributed habitat of sufficient size and spacing for mature and old-growth associated species. Networks are composed of habitat territories capable of supporting successful breeding pairs of particular wildlife species. Specific territory size depends on site suitability and the number of breeding pairs to be supported. The habitat networks in this management area were developed to complement the location and distribution of wilderness and large habitat blocks for the northern spotted owl.

The Managed Habitat Area goals do not vary by alternative; however, the management area varies by alternative in terms of species, number of territories per species, silvicultural strategy and level of timber yield.

**Management Area 15 - Recreational River**

This prescription applies to segments of the Klamath, Trinity, and Smith Rivers and adjacent corridors of land classified as “recreational” by the National Wild and Scenic Rivers Act of 1968, designated by the Secretary of the Interior on January 19, 1981, as well as changes made as a result of the creation of the SRNRA. The overall goal is to provide for a wide range of river oriented recreational activities. For those segments of the Smith River designated as recreational river, a specific goal is to maintain or enhance the anadromous fisheries values. The recreational classification applies to those river segments which are readily accessible by public roads and have experienced substantial human modification to the scenery.

As the recreational rivers on the Forest were designated for their anadromous fisheries values, the Recreational River Management Area also falls within the Riparian Reserve Management Area (except the CUR alternative, which falls within both the Riparian and Retention Management Areas). The Riparian Management Area is more restrictive than the Recreational River Management Area; therefore, no acres are assigned to the Recreational River Management Area in the alternatives. Recreational river values will be given consideration, but riparian management considerations will be given first priority. More specific information on the desired future condition of the recreational river segments will be developed within the individual recreational river management plans.

**Management Area 16 - Partial Retention Visual Quality Objective**

The primary goal of this management area is to maintain the area in a condition that appears near undisturbed. Viewsheds with a VQO of partial retention will have a near undisturbed or undisturbed appearance as seen from sensitive viewing locations. These areas are typically middleground and background viewing areas as seen from highly sensitive viewing areas, or are foreground areas as seen from moderately sensitive viewing locations such as county roads, streams, or trails.

Most management activities are acceptable, considered on a project-by-project basis, and should be designed to meet the partial retention objectives of the visual management system. The overall character of the landscape in a partial retention area may change over time, but individual and cumulative project effects would not dominate the viewed landscape.

**Management Area 17 - General Forest**

This management area includes forested land where commercial timber management will occur. The primary goal is to produce a sustained yield of timber while maintaining other resource values. Timber harvesting can be scheduled on lands identified as suitable throughout this management area. Harvest of Douglas-fir and mixed conifer timber types will occur proportionately to the availability of these two types. Silvicultural activities include timber harvest, reforestation, conifer release, and precommercial and commercial thinning. A relatively small proportion of the General Forest is allocated for other uses such as developed campgrounds, roads, cultural sites, and administrative sites. In addition, a portion of this management area is classified as unsuitable for timber production

## DESCRIPTION OF ALTERNATIVES

This section describes in detail each of the five alternatives considered in this FEIS. Each alternative's description includes a narrative and two tables. The first table displays the allocation of management areas for the alternative. The second table displays Forest-wide outputs and activities for the next 50 years by resource. It also shows expected costs (in 1989 dollars) for the next 50 years of Forest management, and hence portrays the total cost of implementing the alternative. Management areas by alternative are displayed on the alternative maps. Definitions for unfamiliar terms and acronyms may be found in the glossary (Appendix G).

The five alternatives carried forth display different ways of managing the lands and resources of the Six Rivers National Forest. All alternatives also incorporate direction contained in the Management Plan for the Smith River NRA.

Common to the implementation of any of the following alternatives, except possibly the current alternative, are: 1) the requirement of an adjustment and implementation period where shifts in management practices and on-the-ground activities will occur due to new adjusted land allocations; and 2) the implementation of a Geographic Information System (GIS) based analytical tool to evaluate ecosystem structure, components, and processes on a landscape level. The GIS would require an updated resource database that integrates vegetation resources with wildlife, fisheries, botanical, watershed, recreation, and other resource requirements.

Note: the silvicultural and range strategies mentioned in the description of alternatives are listed at the end of this document.

## ALTERNATIVE A: CURRENT/RPA (CUR)

### Theme

This is the "No-Action" alternative, which is a continuation of current management practices. The purpose of this alternative is to provide adequate resource protection and produce outputs and services generally based on current land use designations, budget levels, directions, policies and practices. This alternative balances timber growth and harvesting with the protection of anadromous fish, wildlife, and recreation values.

Wildlife habitat would be managed to sustain well distributed viable populations for all threatened, endangered and sensitive species. HCAs for the northern spotted owl would be removed from the timber regulated land base. The forest matrix outside reserved areas would be managed to meet the 50-11-40 rule, which states that at least 50 percent of the forested landscape in each quarter township must consist of forest stands with a mean diameter of 11 inches and a canopy closure of 40 percent.

This alternative also meets the intent of the 1990 RPA program released in May, 1990. The objectives of the RPA program are to enhance recreation, wildlife, fisheries, soil, and water resource programs, and to maintain historical timber sale levels. Since that direction was released, the recreation program received a substantial increase in emphasis with the designation of the Smith River NRA. The wildlife program has expanded as a result of the listing of the northern spotted owl as a threatened species in May, 1990. Also, soil and water budgets have nearly doubled in the past two years as watershed rehabilitation programs have increased.

The objective of maintaining historical timber outputs has been made unobtainable by the land allocations designated by the Smith River NRA act and the adoption of HCAs. These two land allocations have reduced the size of the timber-suited land base from 478,390 to 269,410 acres.

Management area designations are displayed in Table II-2 and outputs, activities, and costs are displayed in Table II-3. Management area designations are also displayed on the Alternative A Map.

### Direction: Physical Environment

**Watershed:** Projects that improve water quality and fisheries habitat would be emphasized. Existing improvements would be maintained.

### Direction: Biological Environment

**Sensitive Plant Species:** Endangered plant populations and their habitats would be enhanced as necessary to support recovery efforts. Viable sensitive plant populations and their essential habitats would be maintained; habitat improvement projects would be conducted as opportunities become available.

**Wildlife:** A system of managed and special habitat management areas would be maintained to provide for viable populations of all native and desired non-native species. Timber harvesting would not occur within northern spotted owl HCAs and nest protection zones for bald eagle and peregrine falcon. Habitat within eight peregrine falcon territories would be maintained or improved to meet the recovery target of seven nesting pairs. Habitat would be maintained or improved within six bald eagle territories to meet the recovery goal of four nesting pairs and two wintering areas. Sixteen goshawk territories would be maintained outside HCAs and other reserved lands. Timber management within designated northern spotted owl critical habitat areas occurring outside HCAs would emphasize maintenance or replacement of functional late-successional habitat.

Forty marten habitat management areas and 18 fisher habitat management areas would be established throughout the Forest. The habitat management areas would follow the habitat parameters described in "A Literature Review for the Management of Marten and Fisher on National Forests in California" (Freel 1992). These areas are well distributed throughout the Forest and provide sufficient habitat to support successful breeding units and contribute to the maintenance of a viable population. Twenty of the marten and 14 of the fisher habitat management areas are located in HCAs and other reserved areas; the remaining 20 marten and 4 fisher habitat management areas are located throughout the forest matrix to meet spatial distribution guidelines. Forest records indicate that marten have been reported in or adjacent to 8 of the proposed marten habitat management areas, and fisher have been reported in or adjacent to 15 of the proposed fisher habitat management areas.

The forest landscape would be managed to maintain travel corridors for wildlife at approximately 1-mile spacing. Corridors would be comprised of closed canopy stands with relatively open understory conditions which provide required thermal and escape cover for wildlife. Corridors would follow stream courses and continue upslope and over ridgetops to connect drainages.

**Riparian Zones:** Inner gorge and high and extreme landslide areas would have no regulated harvest. Areas outside inner gorge and landslide areas have riparian reserves depending on stream class. Ephemeral streams would have a 50 foot reserve each side, intermittent streams would have a 75 foot reserve, and perennial stream reserves would vary from 100 to 300 feet, depending on stream size. The riparian reserves would be managed for marginal timber yields.

**Fisheries:** Emphasis would be placed upon protecting and maintaining stream and lake ecosystems, including streamside and riparian communities. Stream and watershed integrity would be protected by correcting road and culvert failures, controlling landslides and fine sediment sources, and maintaining sources of large woody debris for channel stability. Water quality would be protected by maintaining temperature at optimum levels. Stream habitat conditions would be improved by increasing the abundance and effective distribution of important instream habitat forming elements (large woody debris and boulders) through the enhancement of natural recruitment and by direct placement.

Over the first 10 years, 1/2 of the available low and medium quality habitat would be improved. Fish habitat on the Forest would be maintained through strict application of standards and guides for all designated riparian reserves, with the specific objectives of limiting potential impacts upon channel and bank stability, maintaining adequate shade canopy, and providing for recruitment of large wood into the channel. Warm water fish habitat capability would be evaluated, and improvement projects would be implemented as appropriate. Opportunities for habitat protection and improvement in resident trout streams would be investigated, particularly where recreational usage or unique characteristics indicate a special value.

## Direction: Resource Management Programs

**Research Natural Areas:** Eight research natural areas and three candidate research natural areas would be managed to maintain their research values.

**Special Interest Areas:** Six botanical areas (Bear Basin, Horse Mountain, Lassics, North Fork Smith River, Broken Rib, Myrtle Creek) and the Bluff Creek geologic area would be managed to maintain their unique botanical values.

To prevent the introduction of the Port-Orford-cedar root fungus disease into uninfested areas of the North Fork Smith River Botanical Area, Forest Service Roads 18N09, 18N13, and associated spur roads would be open to high clearance vehicle access (street legal and non-street legal) with a limited operating season. Gates would be in place and would be closed during the wet season.

**Heritage Resources:** For project related activities, important heritage resource properties would be identified, evaluated, and protected. Heritage resources would be coordinated in accordance with the Forest-wide standards and guidelines and 36 CFR 800.

**Transportation and Facilities:** The Forest transportation system would be managed for user safety and to minimize impacts on other Forest resources. Travel and access routes would be developed for local, recreational, and administrative uses with emphasis on user safety and comfort on arterial routes. Roads would be constructed and maintained to accommodate planned use, prevent resource damage, and reduce road maintenance costs. New road construction would be primarily local roads, level one and two, in response to timber management access needs, with some level three collector roads constructed in response to recreational and other resource management objectives. All level one roads would be closed or obliterated, and some level two roads would be closed seasonally for resource protection and economic efficiency.

Construction of local roads would continue primarily on areas of the forest available for timber management. Road closure and obliteration would occur in most other areas to reduce wildlife disturbance, reduce potential adverse water quality effects, and reduce road maintenance costs. The overall Forest road system would increase from the present level of 2,490 miles to a maximum of 2,590 miles at the end of the fifth decade.

**Fire/Fuels**: Where necessary, activity-created fuels would be treated with prescribed burning or alternate methods. Need for fuels treatment would be determined in consideration of resource needs and wildfire hazard.

**Lands: Uses:** New special use authorizations would be considered only when suitable private land is not available and the use would not conflict with management objectives. Uses would be consolidated as much as possible.

The existing Camp Six, Horse Mountain, and Pickett Peak communication sites would be designated for multi-use commercial communication sites. Use of existing undesignated single-use communication sites would continue to be authorized for minor development, resource monitoring, or government agency use.

**Right-of-way Acquisition:** Road and trail rights-of-way would be acquired for facilities needed for the Forest transportation system.

**Adjustments:** Areas identified for land exchange would be maintained in a condition that optimizes their exchange value. Priority would be given to acquiring available private lands within wilderness and the Smith River National Recreation Area and lands needed to maintain vegetative and biological diversity. Priority would be given to exchanging out of federal ownership lands that have lost their National Forest character.

**Landline:** National Forest property boundaries would be located, established, and maintained as necessary to protect resources and minimize conflicts with adjacent landowners.

**Small Tracts Act:** Encroached areas that have been managed by adjoining landowners and government agencies as private lands would be transferred into private ownership under the Small Tracts Act (STA) when they meet qualifications of the Act and associated regulations. Qualified mineral fractions would also be transferred into private ownership under the STA. Encroached areas within a wild and scenic river corridor would be evaluated concurrently for exclusion from the corridor and STA conveyance and would be conveyed under the STA if excluded from the corridor. Private lands within a wild and scenic river corridor that are offered in exchange or interchange, under the STA, for federal lands within the corridor would be evaluated for inclusion in the corridor.

**Occupancy:** Unauthorized occupancy and use would be resolved through prompt and continuous action.

**Minerals:** National Forest System lands that are not withdrawn from mineral entry would be managed to encourage and facilitate development and production of mineral resources consistent with management area direction.

Reasonable conditions would be imposed in mineral extraction plans of operation to protect surface resources and to reclaim disturbed areas consistent with the statutory rights and responsibilities of operators.

Native American Contemporary Use Areas, Research Natural Areas, and Special Interest Areas would be recommended for withdrawal from mineral entry when further analysis determines that such withdrawal would be needed to protect them for specific management objectives.

**Range:** The level of AM use would be maintained at the current level of 6,610 AMs for the first decade, and would increase to 11,120 AMs in the fifth decade due primarily to increases in transitory range resulting from timber harvest activities. Annual and perennial grasslands would be managed at a low to moderate intensity, and other rangelands managed at a low intensity using range strategy 2.

**Recreation:** Approximately 25 percent of sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Major facility construction would occur within the Smith River NRA during the first decade according to the Smith River NRA Plan; minor small site construction would occur elsewhere. Trails would be maintained on the average of every four years at a minimum standard. Trails management would be centered on wilderness, hiking, and OHV trails. Approximately 10 miles of trails would be constructed or reconstructed during the first decade. An OHV implementation schedule would be developed. Marketing of recreation opportunities would occur at a low level primarily directed at local markets utilizing printed media. Dispersed opportunities would be managed to maintain a setting consistent with the visual quality objective for the area. Opportunities for gathering forest products would be provided.

**Wilderness:** Opportunities would be provided for quality wilderness experiences. Wilderness would be managed to preserve wilderness characteristics.

**Wild and Scenic Rivers:** Designated rivers would be managed to provide quality wild, scenic, and recreational river opportunities, based on the values for which they were designated. Corridor widths would extend a quarter mile from each bank for the Klamath, Trinity and North Fork Eel rivers. The corridors for the wild and scenic rivers in the Smith River NRA will be those identified in the Smith River NRA Management Plan, and the corridors for the South Fork of the Trinity River are those established in the South Fork of the Trinity Wild and Scenic River Plan. See Resource Map 1 for the CUR alternative wild, scenic, and recreational river boundaries.

The Forest Plan would be amended to exclude from the wild and scenic river corridor identified encroached parcels that otherwise qualify for conveyance under the Small Tracts Act when such conveyance would maintain the integrity of the corridor. The Plan would be amended to include in the wild and scenic river corridor parcels of private land offered in exchange or interchange for encroached parcels when such parcels would maintain or enhance the integrity of the corridor.

**Timber:** Silvicultural prescriptions and harvest intensity would be in accordance with management area direction. Timber-suited portions of the general forest management area, which comprise approximately 7 percent of the Forest land base, would be managed using silvicultural strategy 1 to attain full timber yields. Reduced yields would be realized, using silvicultural strategy 2, from available lands with other resource emphases such as partial retention VQO, foraging areas for bald eagle, peregrine falcon and goshawk, and wildlife travel corridors (approximately 8 percent of the land base). Silvicultural strategy 3 would be used and marginal timber yields would be realized from riparian reserve management areas, scenic rivers, harsh soil sites, marten and fisher habitat areas, goshawk nest protection zones, and designated critical habitat for the northern spotted owl outside HCAs and other reserved lands (approximately 11 percent of the land base). Silvicultural prescriptions would be developed to maintain tree species diversity. Mixed conifer/ hardwood stands would be managed to maintain a hardwood component. Full product utilization, including hardwoods and down material, would be encouraged.

The allowable annual sale quantity from suitable timber lands would be 67 MMBF. Approximately 2560 acres of late-successional and old-growth stands would be regenerated annually in the first decade. Within most regeneration areas an average of 6 large conifers, as well as hardwoods, 1.5 snags, and 3 down logs per acre would be retained to provide structural diversity. Actual green conifer retention would vary depending on such factors as incidence of disease, windthrow hazard, logging systems constraints, site regenerability, economic viability, and visual quality objective. Clearcutting would be used only where no practical alternative exists. To ensure reforestation success, artificial regeneration would be utilized in most areas. Natural regeneration would be emphasized in difficult to regenerate areas. Table II-2 displays the available timber land base acres and volumes by management area.

**Special Forest Products:** Utilization of other commercial products including fuelwood, pulpwood, Christmas trees, burls, boughs, and mushrooms would be encouraged to the extent compatible with other resource values.

**Pest Management:** Emphasis would be on detection and prevention of pest related damage, especially during droughts and after floods and windstorms. Pest control prescriptions would maintain management area objectives.

**Visual Quality:** Visual quality would be maintained at the retention level in the foreground, middleground and background along all major highways and high-use recreation roads, and around recreation use areas and major bodies of water. Timber emphasis areas would be managed to comply with modification visual quality objectives.

## Environment to be Created

If this alternative were to be implemented, about 73 percent of the Forest would be allocated to uses that would exclude most land disturbance and timber management activities. These allocations would include wilderness, special interest and research natural areas, wild river corridors, northern spotted owl HCAs, bald eagle and peregrine falcon nest protection zone, and areas set aside for the protection of heritage resources. Because of use restrictions, these areas would remain essentially unchanged from their present condition. The current trends and rates of vegetation successional change would continue in these areas. Most local roads would be closed, put to bed, or obliterated to limit motorized access in these areas.

On 19 percent of the land base, resource emphases of various management areas would influence timber production. Limitations on timber harvesting would reduce yields to levels below the sustained-yield capacity. Depending on management area, yields would range from reduced to marginal. These management areas include scenic river corridors, riparian reserves, special regeneration areas, designated critical habitat areas outside HCAs, retention and partial retention visual zones, and territories for some threatened, endangered, and sensitive wildlife species. These areas would show a limited amount of alteration of the natural landscape. Some plantations and young stands would be created through regeneration harvesting; however, over time many of these areas would consist of large stands of mature and older forest. Additional roads would be constructed as necessary to provide access for timber harvesting, administrative and recreational use. Level one maintenance roads would be closed or put to bed to limit access.

Timber production would be the management emphasis within timber suited portions of the general forest management area, which comprises the remaining 8 percent of the Forest. Stands would be harvested as they reach maturity, i.e. when average annual growth begins to decline. This generally occurs at 80 to 120 years of age, depending on site growth potential. Over time, the landscape within these portions of general forest would consist of an even distribution of plantations, young stands of saplings, poles, and early-mature trees. Due to the retention of an average of green trees within regeneration areas, most stands would be multi-storied and multi-species. The sizes of regenerated stands would range from 5 acres to as large as 60 acres to minimize habitat fragmentation. The general forest would be managed to meet modification visual quality objectives, which means that the landscape would appear altered, or in a disturbed condition.

It is expected that recreational use would increase in the Smith River NRA consistent with the NRA Management Plan. Use on the remainder of the Forest would probably remain the same, and would be concentrated along rivers, lakes, and in campgrounds and other public use areas.

## ALTERNATIVE B: PREFERRED (PRF)

### Theme

The theme of this alternative is to use an ecosystem management approach to maintaining healthy forest ecosystems. Biodiversity would be maintained by establishing a large system of reserved areas and managing the matrix outside reserved areas to maintain a distribution of vegetation types, successional stages, and patch sizes within a recommended subset of the historical range of variability. The production of goods and services would be determined by ecological capabilities and the desired condition of specific ecosystems, as well as social and economic considerations.

This alternative incorporates the direction from the Record of Decision for the "Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl" (FSEIS ROD).

Late-successional and riparian reserves would provide protection for a wide range of species dependent on late-succesional/old growth and riparian/aquatic habitats.

The adaptive management process, a continuing cycle of action-based planning, monitoring, researching, evaluating and adjusting, would be used to determine how well management actions achieve the goals of the Forest Plan and what steps are needed to modify activities to increase success or improve results.

The Hayfork Adaptive Management Area would enourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives.

Vegetation management would be designed to mimic natural patterns and levels of stand replacement and provide a near-natural range and distribution of habitats. Timber stand replacement through harvesting and natural disturbances would occur at a rate determined by analyzing past rates of natural stand replacement. This rate ranges from 4 to 8 percent per decade, depending primarily on elevation, aspect, and proximity to the coast.

Regenerated stands would have a green tree retention of at least 15 percent of the area associated with each cutting unit. Snags and down logs would be retained at an average of 80 to 100 percent of the levels currently found in mature and old-growth stands. Hardwoods would me maintained as a stand component. These retention standards would provide a legacy that bridges past and future forests, and provides structural diversity needed to emulate the features of a late-successional and old-growth stands at earlier ages. Intermediate treatments such as thinnings would be designed to accelerate stand development by creating horizontal and vertical diversity, and produce some level of timber output.

Anadromous fisheries would be maintained and enhanced by designating riparian reserves along streams, lakes, ponds, wetlands, and unstable areas, and key watersheds for the protection and enhancement of anadromous fish stocks. Five of the six major river systems on the Forest would have key watersheds in which the anadromous fish resource would receive first priority in the consideration of management alternatives.

Watershed analysis, a systematic process for characterizing watershed and ecological processes to meet specific management and social objectives, would be required in all key watersheds and roadless areas, and would be required in non-key watersheds to modify riparian reserve boundaries.

Connectivity of habitats would be provided through both matrix management and riparian reserves. Riparian reserves would be designed to improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity within and among watersheds. The riparian reserves would also serve as connectivity corridors among late-successional reserves to provide for genetic exchange within populations of sentient species which require successive generations.

The overall miles of roads would decline under this alternative. No new roads would be constructed in roadless areas in key watersheds, and the amount of existing roads in key watersheds would be reduced through the decommissioning of roads. New roads would be built to minimum standards necessary to meet management needs and would then be closed, or in the case of temporary roads, decommissioned.

New recreation facilities would be concentrated in the Smith River NRA. Facilities throughout the rest of the Forest would be upgraded to modern standards.

Management area designations are displayed in Table II-4 and outputs, activities, and costs are displayed in Table II-5, both at the end of this description.

Management area designations are also displayed on the Alternative B Map.

## Direction: Physical Environment

**Watershed:** Emphasis would be placed on watershed restoration projects that improve water quality and benefit fisheries. Existing improvements would continue to be maintained. Areas that contribute to the production of water that does not meet State water quality objectives would be restored by the second decade. Revegetation efforts would use native species to the maximum extent possible.

## Direction: Biological Environment

**Sensitive Plant Species:** Endangered plant populations and their habitats would be enhanced as necessary to support recovery efforts. Viable sensitive plant populations and their essential habitats would be maintained; habitat improvement projects would be conducted as opportunities become available. (Same for all alternatives)

**Wildlife:** A combination of late-successional reserves, riparian reserves, matrix management strategies, and standards and guidelines would provide for viable populations of all native and desired non-native wildlife species. Late-successional reserves would emphasize a shift away from single-species set-asides, providing habitat for a number of species associated with late-successional and old-growth ecosystems including the northern spotted owl, marbled murrelet, marten and fisher. Treatments such as thinnings would be allowed in stands up to 80 years in age to accelerate their development into multilayered stands with large trees and diverse plant species, and structures that may, in turn, maintain or enhance species diversity. A designated managed habitat area would be maintained for species that utilize red fir habitat. Timber harvesting would not occur within stands greater than 80 years in LSRs or nest protection zones for the bald eagle or peregrine falcon. Fourteen peregrine territories would be managed to provide a greater chance of meeting the recovery target of seven breeding pairs. To meet the bald eagle recovery goal of four breeding pairs and two wintering areas, six territories would be maintained. Forest-wide standards and guidelines would protect habitat for occupied goshawk, marten and fisher territories; protection buffers would protect the Del Norte salamander. Survey and manage standards and guidelines would provide benefits to amphibians, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropods.

Vegetation management activities would be designed and distributed to maintain a landscape which provides for wildlife habitat and dispersion. Riparian reserves would provide habitat for riparian and aquatic-dependent species, travel and dispersal corridors for many terrestrial species, and connectivity corridors among the late-successional reserves. These corridors would provide necessary thermal and escape cover, allow for gradual migration between habitat areas for slow moving species, provide reproductive habitat, and facilitate adequate population-level genetic exchange.

**Riparian Zones:** Riparian reserves would be designated for perennial and intermittent streams as well as lakes, ponds, reservoirs, wetlands, and unstable areas. The reserves would be used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent of the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of a watershed. The reserves would also serve as connectivity corridors amoth the Late-Successional Reserves. There would be no regulated harvest, and restrictions would apply for grazing, road construction, and recreational management activities within riparian reserves to meet aquatic conservation strategy objectives. Interim riparian reserve widths would be established, based on ecologic and geomorphic factors, to provide a high level of fish habitat and riparian protection until watershed and site analysis can be completed. After completion of these analyses, riparian reserve widths could be modified to suit site conditions and proposed management activities.

Riparian reserves are specified for five categories of streams or waterbodies as follows:

Fish-bearing streams: Riparian reserves consist of the stream and the area on each side of the stream extending from the outer edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Permanently flowing nonfish-bearing streams: Riparian reserves consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the

outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance, whichever is greater.

Constructed ponds and reservoirs, and wetlands greater than one acre: Riparian reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or the the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than one acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds: Riparian reserves consist of the body of water and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands less than one acre, and unstable and potentially unstable areas: At a minimum, riparian reserves must include: the extent of unstable and potentially unstable areas (including earthflows), the stream channel extending to the top of the inner gorge, the stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, or the extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.

**Fisheries:** Emphasis would be placed on protecting and enhancing riparian ecosystems. Riparian reserves would be designated for perennial and intermittent streams as well as lakes, ponds, springs and wetlands. The riparian reserve width would vary according to stream classification and wetland size. In addition, key watersheds would be designated within five of the six major river systems on the Forest. Approximately 70 percent of the Forest would be within designated key watersheds. These key watersheds, designated to contribute to the conservation of at-risk salmonid and residentfish species, will receive the first priority for restoration programs. A watershed analysis would be required prior to most management activities in key watersheds. See the riparian resource under this alternative for more information regarding the management of riparian zones.

## Direction: Resource Management Programs

**Research Natural Areas:** Eight research natural areas and three candidate research natural areas would be managed to maintain their research values. (Same for all alternatives)

**Special Interest Areas:** Six botanical areas (Lassics, Horse Mountain, and four within the NRA), and the Bluff Creek geologic interest area would be managed to maintain their unique characteristics and provide for public use.

To prevent the introduction of the Port-Orford-cedar root fungus disease into uninfested areas of the North Fork Smith River Botanical Area, Forest Service Road 18N13 would be closed to vehicle access. Vehicle access into remaining areas (FS Road 18N09 and associated spur roads) would be prohibited pursuant to 36 CFR 261.50; the prohibition would exempt officials pursuant to 36 CFR 261.50(d)(4) and persons with a permit, special-use authorization, or operating plan, as defined in 36 CFR 261.2, issued by the District Ranger or higher ranked authorized official. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

**Heritage Resources:** For project related activities, important heritage resource properties would be identified, evaluated, and protected. Heritage resources would be coordinated in accordance with the Forest-wide standards and guidelines and 36 CFR 800. (Same in all alternatives)

**Transportation and Facilities:** The Forest transportation system would be managed for user safety and to minimize impacts on Forest resources, the landscape, and wildlife and riparian habitat. Travel and access routes would be developed for local, recreational, and administrative uses with emphasis on user safety and comfort on arterial routes. Roads would be constructed and maintained to minimum standards to accommodate planned use, prevent resource damage, and reduce road maintenance costs. New road construction would be primarily local roads, level one and two, in response to management access needs, with some level three collector roads constructed in response to recreational and other resource management objectives.

Road closure and obliteration would occur primarily in reserved areas and in key watersheds to reduce potential adverse effects on water quality and fish

stocks, reduce wildlife disturbance, and reduce road maintenance costs. The overall Forest road system would decrease from the present level of 2,490 miles to 2,060 miles at the end of the fifth decade.

**Fire/Fuels**: Fuels treatment would be used to reduce fire hazards, enhance the structure and composition of plant communities, enhance the production of plants and other materials for Native American gathering, and to manage for other resources such as wildlife habitat. Fuels treatment prescriptions would be designed to reduce emissions and retain snags, large woody debris, and the soil organic layer wherever possible.

**Lands: Uses:** New special use authorizations would be considered only when suitable private land is not available and the use would not conflict with management objectives. Uses would be consolidated as much as possible. (Same in all alternatives)

The existing Camp Six, Horse Mountain, and Pickett Peak communication sites would be designated for multi-use commercial communication sites. Use of existing undesignated single-use communication sites would continue to be authorized for minor development, resource monitoring, or government agency use. (Same in all alternatives)

**Right-of-way Acquisition:** Road and trail rights-of-way would be acquired for facilities needed for the Forest transportation system. (Same in all alternatives)

**Adjustments:** Areas identified for land exchange would be maintained in a condition that optimizes their exchange value. Priority would be given to acquiring available private lands within wilderness and the Smith River National Recreation Area and lands needed to maintain vegetative and biological diversity. Priority would be given to exchanging out of federal ownership lands that have lost their National Forest character. (Same in all alternatives)

**Landline:** National Forest property boundaries would be located, established, and maintained as necessary to protect resources and minimize conflicts with adjacent landowners. (Same in all alternatives)

**Small Tracts Act:** Encroached areas that have been managed by adjoining landowners and government agencies as private lands would be transferred into private ownership under the STA when they meet qualifications of the Act and associated regulations. Qualified mineral fractions would also be transferred into private ownership under the STA. Encroached areas and mineral fractions within a wild and scenic river corridor would be evaluated concurrently for exclusion from the corridor and STA conveyance and would be conveyed under the STA if excluded from the corridor. Private lands within a wild and scenic river corridor that are offered in exchange or interchange, under the STA, for federal lands within the corridor would be evaluated for inclusion in the corridor. (Same as the OGR alternative)

**Occupancy:** Unauthorized occupancy and use would be resolved through prompt and continuous action. (Same in all alternatives)

**Minerals:** National Forest System lands that are not withdrawn from mineral entry would be managed to encourage and facilitate development and production of mineral resources consistent with management area direction.

Reasonable conditions would be imposed in mineral extraction plans of operation to protect surface resources and to reclaim disturbed areas consistent with the statutory rights and responsibilities of operators. (Same in all alternatives)

Native American Contemporary Use Areas, Research Natural Areas, and Special Interest Areas would be recommended for withdrawal from mineral entry when further analysis determines that such withdrawal would be needed to protect them for specific management objectives.

**Range:** The level of AM use would remain at the current level of 6,610 AMs for the first through the fifth decades. The majority of the allotments would be managed using range strategies 2 and 3. Allotments requiring vegetation manipulation and improved grazing systems to meet range, watershed, riparian, and wildlife objectives would be managed using range strategy 4.

**Recreation:** Approximately 50 percent of developed sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Major facility construction would occur within the Smith River NRA during the first decade according to the Smith River NRA Plan; minor small site construction would occur elsewhere. Trails would

be maintained on the average of every three years as determined by user needs. Trails management would expand to include management for equestrian and mountain bikes. Approximately 16 miles of trails would be constructed or reconstructed during the first decade. An OHV implementation schedule would be developed. Staging areas with facilities to accommodate OHV use would be constructed during the first decade. Interpretive sites would be developed in areas of concentrated recreation use. Marketing of recreation opportunities would expand to include regional markets utilizing a variety of media. Dispersed opportunities would be promoted and managed to emphasize a semi-primitive or natural setting. Opportunities for gathering plant materials would be expanded and promoted. Wildlife viewing and other non-consumptive wildlife opportunities would be expanded.

**Wilderness:** Opportunities would be provided for quality wilderness experiences. Wilderness would be managed to preserve wilderness characteristics. (Same for all alternatives)

**Wild and Scenic Rivers:** Designated rivers would be managed to provide quality wild, scenic, and recreational river opportunities, based on the values for which they were designated. Recreational and scenic river corridors on the Klamath and Trinity Rivers would follow the riparian reserve boundary, with exceptions for private lands and small tracts act parcels. The wild river boundary for the North Fork Eel would be based on visual considerations, with adjustments for private land and wilderness. The corridors for the wild and scenic rivers in the Smith River NRA would be those identified in the Smith River NRA Management Plan, and the corridors for the South Fork of the Trinity River would be those established in the South Fork of the Trinity Wild and Scenic River Plan. See resource Map 2 for the PRF alternative wild, scenic, and recreational river boundaries.

A suitability study would be performed on the eligible segments of Blue Creek, Redwood Creek, and Red Mountain Creek to determine whether they are suitable for inclusion into the Wild and Scenic Rivers System.

The rivers designated under Section 2.a.ii. of the Wild and Scenic Rivers Act by the Secretary of the Interior

would be recommended for redesignation by Congress under Section 3.a. of the Act.

The Forest Plan would be amended to exclude from the wild and scenic river corridor identified encroached parcels and mineral fractions that otherwise qualify for conveyance under the Small Tracts Act when such conveyance would maintain the integrity of the corridor. The Plan would be amended to include in the wild and scenic river corridor parcels of private land offered in exchange or interchange for encroached parcels or mineral fractions when such parcels would maintain or enhance the integrity of the corridor.

**Timber:** Produce and sell timber in a manner reflective of natural stand replacement, both in the size and in the number of openings, using silvicultural strategy 5. A full range of silvicultural prescriptions would be utilized to achieve this objective. Approximately 520 acres of intermediate harvesting would occur annually in the first decade, focusing within well stocked and overstocked young and mature stands. Intermediate harvesting would be designed to maintain habitat function, accelerate growth, and promote the development of vertical and horizontal diversity by creating snags, down logs, gaps in the canopy, variable stand densities, and secondary canopy layers. Regeneration harvest would occur on approximately 360 acres annually in the first decade, and would be designed to meet desired conditions in terms of the distribution of vegetation types and successional stages across specific landscapes. Tree species composition would be maintained through the retention of a representative legacy from the original timber stand. This would include a green tree retention of at least 15 percent of the area associated with each cutting unit, as well as the retention of snags and down logs at 40 to 100 percent of background levels. These components would provide structural diversity for the newly regenerated conifer forest. As a general guide, 70 percent of the total area to be retained would be clumped, with the remainder dispersed as individual trees or smaller clumps; retention on a given site would vary depending on such factors as incidence of disease, windthrow hazard, site regenerability, and wildlife habitat needs. Clearcutting would only be utilized on those acres which do not provide the minimum retainable legacy and would be limited to 10 percent of the regenerated acres, or 90 acres per year. To ensure reforestation success, artificial regeneration would be utilized in most areas. Natural regeneration would be emphasized on sites which are difficult to plant. There would be no site conversion of hardwood stands to conifer stands.

The allowable annual sale quantity from suitable timber lands would be 15.5 MMBF. Silvicultural prescriptions and harvest intensity would be in accordance with management area direction. Silvicultural strategy 5 would produce greatly reduced yields on 8 percent of the Forest, including the general forest management area and other management areas such as partial retention VQO, managed habitat areas, and some parts of the Smith River NRA. Silvicultural strategy 3 would be used and marginal yields would be realized from visual retention zones, scenic river corridors and some parts of the Smith River NRA (approximately 1 percent of the land base). Silvicultural prescriptions would be developed to maintain tree species diversity. Mixed conifer/ hardwood stands would be managed to maintain a hardwood component. Full product utilization, including hardwoods and down material, would be encouraged. The size of individual regeneration openings would range from 5 acres to 60 acres to minimize habitat fragmentation. Table II-4 displays the available timber land base acres and volumes by management area.

**Special Forest Products:** Utilization of other commercial products including fuelwood, pulpwood, Christmas trees, burls, boughs, and mushrooms would be encouraged to the extent compatible with other resource values. (Same for all alternatives)

**Pest Management:** Emphasis would be on detection and prevention of pest related damage, especially during droughts and after floods and windstorms. Pest control prescriptions would maintain management area objectives. (Same as the CUR, OGR, and MKT alternatives)

**Visual Quality:** High use recreation roads, developed recreation areas, major water bodies, and highways 199, 299, 96, and 36 would be assigned Sensitivity Level 1 as described in USDA, Forest Service, Agriculture Handbook 462, The Visual Management System. Retention and partial retention would be the primary visual quality objectives. The majority of other areas in the Forest would be managed to meet at least the partial retention visual quality objective.

## Environment to be Created

About 91 percent of the Forest would be allocated to uses that would exclude most land disturbance and timber management activities. These include botanical areas, riparian reserves, research natural areas, wilderness, wild river corridors, LSRs, nest protection zones for the bald eagle and peregrine falcon, and areas set aside for the protection of heritage resources. Because of use restrictions, these areas would remain essentially unchanged from their present condition. The current trends and rates of successional change would continue in these areas. Most secondary roads would be closed to limit motorized access in these areas.

On 1 percent of the land base, resource emphases of various management areas would result in the production of marginal timber yields. These areas include retention visual areas, scenic river corridors and parts of the Smith River NRA. Some small (generally 5 to 10 acres) plantations and young stands would be created through regeneration harvesting, however, over time the majority of these areas would consist of large stands of mature and older forest. Due to the retention of green conifers and hardwoods at regeneration harvest and to the design of intermediate harvests, most stands would be multi-storied and multi-species. Additional roads would be constructed as necessary to provide access for harvesting, and administrative and recreational use.

The remaining 8 percent of the land base would be managed for timber production and for important ecological functions such as dispersal of organisms, carrover of some species from one stand to the next, amd the maintenance of structural components such as down logs, snags, and large trees. This area would also add ecological diversity by providing early-successional habitat. Greatly reduced timber yields would be produced. Over time the landscape would consist of relatively large (generally 20 to 40 acre) stands of various successional stages (seedlings/brush; saplings; poles; and young, mature, and old-growth).

The Forest road system would decrease from the existing level of 2,490 miles to 2,060 miles at the end of the fifth decade, and open road densities would decrease over time.

Recreation use would increase slightly as compared to the CUR alternative.

## ALTERNATIVE C: OLD GROWTH RESERVE (OGR)

### Theme

This alternative emphasizes the preservation of late successional forests, and is similar to alternative 12C of the Report of the Scientific Panel on Late-Successional Forest Ecosystems (Johnson et al. 1991). Rather than having single-species management areas for the spotted owl and other species dependent on late-successional and old-growth ecosystems, large areas of late-successional forest called "old-growth reserves" are designated and are removed from the regulated timber land base. Approximately 550,000 acres of old-growth reserve occur within the Forest, and 365,000 of these are outside reserved areas such as wilderness, wild rivers and research natural areas. The matrix lands outside reserved areas would be managed under a 180-year rotation using silvicultural strategy 2.

Management area designations are displayed in Table II-6 and outputs, activities, and costs are displayed in Table II-7, both at the end of this description. Management area designations are also displayed on the Alternative C Map.

### Direction: Physical Environment

**Watershed:** Emphasis would be placed on watershed restoration projects that improve water quality and benefit fisheries. Existing improvements would continue to be maintained. Areas that contribute to the production of water that does not meet State water quality objectives would be restored by the second decade. Revegetation efforts would use native species to the maximum extent possible.

### Direction: Biological Environment

**Sensitive Plant Species:** Endangered plant populations and their habitats would be enhanced as necessary to support recovery efforts. Viable sensitive plant populations and their essential habitats would be maintained; habitat improvement projects would be conducted as opportunities become available. (Same for all alternatives)

**Wildlife:** Timber harvesting would not occur in old growth reserves or nest protection zones for the bald eagle, peregrine falcon and northern goshawk outside of old growth reserves. Fourteen peregrine falcon territories would be managed to provide a greater chance of meeting the recovery target of seven breeding pairs. To meet the bald eagle recovery goal of four breeding pairs and two wintering areas, six territories would be maintained. Marten habitat management areas outside old growth reserves would not have regulated timber harvest, but fisher habitat management areas outside old growth reserves would be managed for greatly reduced yields.

**Riparian Zones:** Riparian reserves would be designated for perennial and intermittent streams as well as lakes, ponds, springs and wetlands. There would be no regulated harvest within riparian reserves. The riparian reserve width would vary according to stream classification and wetland size, but could range from 100 feet each side of intermittent streams and around wetlands less than one acre to 300 feet each side of Class I and II streams. The management strategy for the riparian reserves would provide for the following:

1. Maintenance of water quality;
2. Maintenance of stream channel integrity and bank stability;
3. Maintenance of natural flow regimes;
4. Maintenance of present and future sources of wood debris input to the aquatic system;
5. Maintenance of native or desired non-native plant community diversity;
6. Maintenance of native and desired non-native vertebrate and invertebrate species;
7. Maintenance of natural canopy closure; and
8. Maintenance of natural ground cover.

**Fisheries:** Emphasis would be placed on protecting and enhancing riparian ecosystems. Riparian reserves would be designated for perennial and intermittent streams as well as lakes, ponds, springs and wetlands. The riparian reserve width would vary according to stream classification and wetland size. In addition, key watersheds would be designated within five of the six major river systems on the Forest. The anadromous fisheries resource would receive first priority in assessing management alternatives in those key watersheds. The goals for management of the key watersheds are:

1. Provide habitat essential to the health of identified fish stocks.
2. Aid in the recovery of anadromous fish stocks identified as being at moderate to high risk of extinction by the American Fisheries Society (Nehlsen at al., 1991 and Higgins et al., 1992).

3. Maintain aquatic biodiversity of the riparian ecosystem.

Approximately 70 percent of the Forest would be within designated key watersheds. See the riparian zone heading under this alternative for more information regarding the management of riparian zones.

## Direction: Resource Management Programs

**Research Natural Areas:** Eight research natural areas and three candidate research natural areas would be managed to maintain their research values. (Same for all alternatives)

**Special Interest Areas:** Six botanical areas (Lassics, Horse Mountain, and four within the NRA), and the Bluff Creek geologic interest area would be managed to maintain their unique characteristics and provide for public use. (Same as the PRF alternative)

To prevent the introduction of the Port-Orford-cedar root fungus disease into uninfested areas of the North Fork Smith River Botanical Area, no vehicle access would be allowed from Diamond Creek to the Gasquet Toll Road (County Road 314), except under an approved operating plan. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

**Heritage Resources:** For project related activities, important heritage resource properties would be identified, evaluated, and protected. Heritage resources would be coordinated in accordance with the Forest-wide standards and guidelines and 36 CFR 800. (Same in all alternatives)

**Transportation and Facilities:** The Forest transportation system would be managed for user safety and to minimize impacts on Forest resources, the landscape, and wildlife habitat. Travel and access routes would be developed for local, recreational, and administrative uses with emphasis on user safety and comfort on arterial routes. Roads would be constructed and maintained to minimum standards to accommodate planned use, prevent resource damage, and reduce road maintenance costs. New road construction would be primarily local roads, level one and two, in response to management access needs, with some level three collector roads constructed in response to recreational and other resource management objectives.

Road closure and obliteration would occur in reserved areas and in key watersheds to reduce potential adverse water quality and riprarian habitat effects, reduce wildlife disturbance, and reduce road maintenance costs. The overall Forest road system would decrease from the present level of 2,490 miles to 2,300 miles at the end of the fifth decade.

**Fire/Fuels**: Fuels treatment would be used to reduce fire hazards, enhance the structure and composition of plant communities, enhance the production of plants and other materials for Native American gathering, and to manage for other resources such as wildlife habitat. Fuels treatment prescriptions would be designed to reduce emissions and retain snags, large woody debris, and the soil organic layer wherever possible. (Same as the PRF alternative)

**Lands: Uses:** New special use authorizations would be considered only when suitable private land is not available and the use would not conflict with management objectives. Uses would be consolidated as much as possible. (Same in all alternatives)

The existing Camp Six, Horse Mountain, and Pickett Peak communication sites would be designated for multi-use commercial communication sites. Use of existing undesignated single-use communication sites would continue to be authorized for minor development, resource monitoring, or government agency use. (Same in all alternatives)

**Right-of-way Acquisition:** Road and trail rights-of-way would be acquired for facilities needed for the Forest transportation system. (Same in all alternatives)

**Adjustments:** Areas identified for land exchange would be maintained in a condition that optimizes their exchange value. Priority would be given to acquiring available private lands within wilderness and the Smith River National Recreation Area and lands needed to maintain vegetative and biological diversity. Priority would be given to exchanging out of federal ownership lands that have lost their National Forest character. (Same in all alternatives)

**Landline:** National Forest property boundaries would be located, established, and maintained as necessary to protect resources and minimize conflicts with adjacent landowners. (Same in all alternatives)

**Small Tracts Act:** Encroached areas that have been managed by adjoining landowners and government agencies as private lands would be transferred into private ownership under the STA when they meet qualifications of the Act and associated regulations. Qualified mineral fractions would also be transferred into private ownership under the STA. Encroached areas and mineral fractions within a wild and scenic river corridor would be evaluated concurrently for exclusion from the corridor and STA conveyance and would be conveyed under the STA if excluded from the corridor. Private lands within a wild and scenic river corridor that are offered in exchange or interchange, under the STA, for federal lands within the corridor would be evaluated for inclusion in the corridor. (Same as the PRF alternative)

**Occupancy:** Unauthorized occupancy and use would be resolved through prompt and continuous action. (Same in all alternatives)

**Minerals:** National Forest System lands that are not withdrawn from mineral entry would be managed to encourage and facilitate development and production of mineral resources consistent with management area direction.

Reasonable conditions would be imposed in mineral extraction plans of operation to protect surface resources and to reclaim disturbed areas consistent with the statutory rights and responsibilities of operators. (Same in all alternatives)

Native American Contemporary Use Areas, Research Natural Areas, and Special Interest Areas would be recommended for withdrawal from mineral entry when further analysis determines that such withdrawal would be needed to protect them for specific management objectives.

**Range:** The level of AM use would decrease from the current level of 6,610 AMs in the first decade to 5,840 AMs by the fifth decade as existing permits within wilderness areas expire or are otherwise released by the current permittees. Rangelands within wilderness would be managed using range strategy 1; rangelands outside wilderness would be managed using range strategy 2.

**Recreation:** Approximately 50 percent of developed sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Major facility construction would occur within the Smith River NRA during the first decade according to the Smith River NRA Plan; minor small site construction would occur elsewhere. Trails would be maintained on the average of every three years as determined by user needs. Trails management would expand to include management for equestrian and mountain bikes. Approximately 16 miles of trails would be constructed or reconstructed during the first decade. An OHV implementation schedule would be developed. Staging areas with facilities to accommodate OHV use would be constructed during the first decade. Interpretive sites would be developed in areas of concentrated recreation use. Marketing of recreation opportunities would expand to include regional markets utilizing a variety of media. Dispersed opportunities would be promoted and managed to emphasize a semi-primitive or natural setting. Opportunities for gathering plant materials would be expanded and promoted. Wildlife viewing and other non-consumptive wildlife opportunities would be expanded. (Same as the PRF alternative)

**Wilderness:** Opportunities would be provided for quality wilderness experiences. Wilderness would be managed to preserve wilderness characteristics. (Same for all alternatives)

**Wild and Scenic Rivers:** Designated rivers would be managed to provide quality wild, scenic, and recreational river opportunities, based on the values for which they were designated. Recreational and scenic river corridors on the Klamath and Trinity Rivers would follow the riparian reserve boundary, with exceptions for private lands and small tracts act parcels. The wild river boundary for the North Fork Eel would be based on visual considerations, with adjustments for private land and wilderness. The corridors for the wild and scenic rivers in the Smith River NRA would be those identified in the Smith River NRA Management Plan, and the corridors for the South Fork of the Trinity River would be those established in the South Fork of the Trinity Wild and Scenic River Plan. See Resource Map 2 for the OGR alternative wild, scenic, and recreational river boundaries.

The Forest Plan would be amended to exclude from the wild and scenic river corridor identified encroached parcels and mineral fractions that otherwise qualify for conveyance under the Small Tracts Act when such conveyance would maintain the integrity of the corridor. The Plan would be amended to include in the wild and scenic river corridor parcels of private land

offered in exchange or interchange for encroached parcels or mineral fractions when such parcels would maintain or enhance the integrity of the corridor. (Same as the PRF alternative)

**Timber:** Matrix lands would be managed under a 180-year rotation using silvicultural strategy 2. A small amount (150 acres) of intermediate harvesting would occur annually within overmature stands and well stocked and overstocked young and mature stands. Regeneration harvest would occur on approximately 810 acres annually for the first decade, primarily within poorly stocked mature and overmature stands. Regenerated stands would have a green tree retention averaging six trees per acre greater than the quadratic mean diameter of the stand, and would retain a range of three to six snags, four to six down logs, and hardwoods to provide for structural diversity. Clearcutting would be utilized only on those acres which do not provide the minimum retainable legacy and would be limited to 140 acres per year.

The allowable annual sale quantity from suitable timber lands would be 26.5 MMBF. Silvicultural prescriptions and harvest intensity would be in accordance with management area direction. Silvicultural strategy 2 would produce reduced yields on 9 percent of the land base, including the general forest management area and some managed habitat areas. These consist of foraging areas for bald eagle, peregrine falcon and northern goshawk, and fisher habitat management areas. Silvicultural strategy 3 would be used and marginal yields would be realized from approximately 7,900 acres of the timber suited land base, including visual retention zones and scenic river corridors; these comprise approximately 1 percent of the land base. Table II-6 displays the available timber land base acres and volumes by management area.

**Special Forest Products:** Utilization of other commercial products including fuelwood, pulpwood, Christmas trees, burls, boughs, and mushrooms would be encouraged to the extent compatible with other resource values. (Same for all alternatives)

**Pest Management:** Emphasis would be on detection and prevention of pest related damage, especially during droughts and after floods and windstorms. Pest control prescriptions would maintain management area objectives. (Same as the CUR, PRF, OGR and MKT alternatives)

**Visual Quality:** High use recreation roads, developed recreation areas, major water bodies, and highways 199, 299, 96, and 36 would be assigned Sensitivity Level 1 as described in USDA, Forest Service, Agriculture Handbook 462, The Visual Management System. Retention and partial retention would be the primary visual quality objectives. The majority of other areas in the Forest would be managed to meet at least the partial retention visual quality objective. (Same as the PRF alternative)

## Environment to be Created

Roughly 89 percent of the Forest would be allocated to uses that would exclude most land disturbance and timber management activities. Examples of such uses are botanical areas, research natural areas, wilderness, wild river corridors, old growth reserves and areas set aside for the protection of heritage resources. Because of use restrictions, these areas would remain essentially unchanged from their present condition. The current trends and rates of vegetation successional change would continue in these areas.

Approximately 10 percent of the Forest would consist of management areas that would have some regulated timber harvest, and would be roaded to some degree. Arterial and collector roads (main roads) would be distributed fairly uniformly in these management areas (see Alternative C Map); local roads would be concentrated in areas managed for timber harvest. The Forest road system would decrease to a maximum of 2,300 miles at the end of the fifth decade.

Of this 10 percent, approximately 1 percent of the Forest would be allocated to uses that would limit land disturbance and vegetation management activities that would occur with long rotation periods. Examples of such areas include scenic river corridors and retention visual zones. Because of the use limitations, these areas would show a limited amount of alteration of the landscape, and would appear relatively undisturbed looking. Motorized access would be limited in these parts of the Forest.

The remainder of the Forest under this alternative (approximately 11 percent) would be available for all uses, including timber management at greatly reduced yields, and would be in various stages of development as a result of timber harvest and road construction activities.

Recreation use would be the same as the PRF alternative.

## ALTERNATIVE D: MARKET (MKT)

### Theme

This alternative emphasizes timber production, commercial salmon fisheries, and developed recreation. Limitations on the timber land base and management intensity are those minimum levels set by current policy and regulation. Timber management would utilize clearcutting as the primary prescription. Clearcuts would range in size from 5 to 60 acres. Fisheries enhancement would focus on capital investments to improve spawning and rearing habitat for chinook salmon with supplementation of production through construction of spawning channels and rearing ponds. The focus of recreation would be on developing sites and facilities. Provision for protection of species associated with late-successional forests would rely on reserved areas (wilderness, research natural areas, HCAs, wild and scenic rivers, unmanaged portions of the Smith National Recreation Area, peregrine falcon and bald eagle nest protection zones), and wildlife emphasis areas for bald eagle, peregrine falcon, and northern goshawk.

The purpose of this alternative is to produce outputs with commercial value. Timber outputs are increased relative to the other alternatives by making more land available for timber production and by using clearcutting as the primary method of harvest.

Management area designations are displayed in Table II-8 and outputs, activities, and costs are displayed in Table II-9, both at the end of this description. Management area designations are also displayed on the Alternative D Map.

### Direction: Physical Environment

**Watershed:** Projects that improve water quality and fisheries habitat would be emphasized. Existing improvements would be maintained. (Same as the CUR alternative)

### Direction: Biological Environment

**Sensitive Plant Species:** Endangered plant populations and their habitats would be enhanced as necessary to support recovery efforts. Viable sensitive plant populations and their essential habitats would be maintained; habitat improvement projects would be conducted as opportunities become available. (Same for all alternatives)

**Wildlife:** A system of managed and reserved wildlife areas would be maintained to provide for viable populations of all native and desired non-native species. Timber harvesting would not occur within northern spotted owl HCAs and nest protection zones for bald eagle and peregrine falcon. Habitat within eight peregrine falcon territories would be maintained or improved to meet the recovery target of seven nesting pairs. Habitat would be maintained or improved within six bald eagle territories to meet the recovery goal of four nesting pairs and two wintering areas. Sixteen goshawk territories would be maintained outside HCAs and other reserved lands. Timber management within designated NSO critical habitat areas occurring outside HCAs would emphasize maintenance or replacement of functional late successional habitat. Manage other wildlife habitat through coordination with other resource activities (primarily timber harvest).

**Riparian Zones:** Inner gorge and high and extreme landslide areas would have no regulated harvest. Areas outside inner gorge and landslide areas have riparian reserves depending on stream class. Ephemeral streams would have a 50 foot reserve each side, intermittent streams would have a 75 foot reserve, and perennial stream reserves would vary from 100 to 300 feet, depending on stream size. The riparian reserves would be managed for marginal timber yields. (Same as the CUR and ECR alternatives)

**Fisheries:** Emphasis would be placed upon protecting and maintaining stream and lake ecosystems, including streamside and riparian communities. Stream and watershed integrity would be protected by correcting road and culvert failures, controlling landslides and fine sediment sources, and maintaining sources of large woody debris for channel stability. Water quality would be protected by maintaining temperature below lethal thresholds and by addressing potential contamination problems. Stream habitat conditions would be improved by increasing the abundance and effective distribution of important instream habitat forming elements (large woody debris and boulders) through the enhancement of natural recruitment and by direct placement.

Over the first 20 years, 1/2 of the available low and medium quality habitat would be improved. Fish habitat on the Forest would be maintained through strict application of standards and guides for all designated riparian reserves, with the specific objectives of limiting potential impacts upon channel and bank stability, maintaining adequate shade canopy,

and providing for recruitment of large wood into the channel. Warm water fish habitat capability would be evaluated, and improvement projects would be implemented as appropriate. Opportunities for habitat protection and improvement in resident trout streams would be investigated, particularly where recreational usage or unique characteristics indicate a special value. (Same as the CUR alternative)

## Direction: Resource Management Programs

**Research Natural Areas:** Eight research natural areas and three candidate research natural areas would be managed to maintain their research values. (Same for all alternatives)

**Special Interest Areas:** Maintain the four botanical areas designated within the Smith River National Recreation Area. The Horse Mountain and Lassics areas would be included in the timber regulated land base and would be managed to maintain or enhance their botanical values. (Same as the ECR alternative)

To prevent the introduction of the Port-Orford-cedar root fungus disease into uninfested areas of the North Fork Smith River Botanical Area, vehicle access to the area would be controlled by permit. All vehicles would be prohibited pursuant to 36 CFR 261.50; the prohibition would exempt officials pursuant to 36 CFR 261.50(d)(4) and persons with a permit, special-use authorization, or operating plan, as defined in 36 CFR 261.2, issued by the District Ranger or higher ranked authorized official. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

**Heritage Resources:** For project related activities, important heritage resource properties would be identified, evaluated, and protected. Heritage resources would be coordinated in accordance with the Forest-wide standards and guidelines and 36 CFR 800. (Same in all alternatives)

**Transportation and Facilities:** The Forest transportation system would be managed for user safety and to minimize impacts on other Forest resources. Travel and access routes would be developed for local, recreational, and administrative uses with emphasis on user safety and comfort on arterial routes. Roads would be constructed and maintained to accommodate planned use, prevent resource damage, and reduce road maintenance costs.

New road construction would be primarily local roads, level one and two, in response to timber management access needs, with some level three collector roads constructed in response to recreational and other resource management objectives. All level one roads would be closed or obliterated, and some level two roads would be closed seasonally for resource protection and economic efficiency.

Construction of local roads would continue primarily on areas of the forest available for timber management. Road closure and obliteration would occur in most other areas to reduce wildlife disturbance, reduce potential adverse water quality effects, and reduce road maintenance costs. The overall Forest road system would increase from the present level of 2,490 miles to a maximum of 2,610 miles at the end of the fifth decade.

**Fire/Fuels**: Where necessary, activity-created fuels would be treated with prescribed burning or alternate methods. Need for fuels treatment would be determined in consideration of resource needs and wildfire hazard. (Same as the CUR alternative)

**Lands: Uses:** New special use authorizations would be considered only when suitable private land is not available and the use would not conflict with management objectives. Uses would be consolidated as much as possible. (Same in all alternatives)

The existing Camp Six, Horse Mountain, and Pickett Peak communication sites would be designated for multi-use commercial communication sites. Use of existing undesignated single-use communication sites would continue to be authorized for minor development, resource monitoring, or government agency use. (Same in all alternatives)

**Right-of-way Acquisition:** Road and trail rights-of-way would be acquired for facilities needed for the Forest transportation system. (Same in all alternatives)

**Adjustments:** Areas identified for land exchange would be maintained in a condition that optimizes their exchange value. Priority would be given to acquiring available private lands within wilderness and the Smith River National Recreation Area and lands needed to maintain vegetative and biological diversity. Priority would be given to exchanging out of federal ownership lands that have lost their National Forest character. (Same in all alternatives)

**Landline:** National Forest property boundaries would be located, established, and maintained as necessary to protect resources and minimize conflicts with adjacent landowners. (Same in all alternatives)

**Small Tracts Act:** Small parcels of land that qualify as encroached areas or mineral fractions under the STA would be transferred into private ownership under the Act. Areas within 300 feet of the bank of a wild and scenic river would not qualify for conveyance under the STA, except as provided for in the Smith River NRA Act and the South Fork Trinity Wild and Scenic River Management Plan. (Same as the ECR alternative)

**Occupancy:** Unauthorized occupancy and use would be resolved through prompt and continuous action. (Same in all alternatives)

**Minerals:** National Forest System lands that are not withdrawn from mineral entry would be managed to encourage and facilitate development and production of mineral resources consistent with management area direction.

Reasonable conditions would be imposed in mineral extraction plans of operation to protect surface resources and to reclaim disturbed areas consistent with the statutory rights and responsibilities of operators. (Same in all alternatives)

Native American Contemporary Use Areas, Research Natural Areas, and Special Interest Areas would be recommended for withdrawal from mineral entry when further analysis determines that such withdrawal would be needed to protect them for specific management objectives.

**Range:** The level of AM use would increase from 6,610 AMs in the first decade to 17,420 AMs in the fifth decade. This increase would result from more intensive management of annual and perennial grasslands and the utilization of increases in transitory range as a result of timber harvest activities. Rangelands would be managed using range strategy 5.

**Recreation:** Approximately 25 percent of sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Major facility construction would occur within the Smith River NRA during the first decade according to the Smith River NRA Plan; minor small site construction would occur elsewhere. Trails would be maintained on the average of every four years at a minimum standard. Trails management would be centered on wilderness, hiking, and OHV trails. Approximately 10 miles of trails would be constructed or reconstructed during the first decade. An OHV implementation schedule would be developed. Marketing of recreation opportunities would occur at a low level primarily directed at local markets utilizing printed media. Dispersed opportunities would be managed to maintain a semi-primitive or natural setting. Opportunities for gathering forest products would be provided. (Same as the CUR and ECR alternatives)

**Wilderness:** Opportunities would be provided for quality wilderness experiences. Wilderness would be managed to preserve wilderness characteristics. (Same for all alternatives)

**Wild and Scenic Rivers:** Designated rivers would be managed to provide quality wild, scenic and recreational river opportunities, based on the values for which they were designated. River corridors on the Klamath, Trinity and North Fork Eel Rivers would extend 300 feet from each bank without exceptions for Small Tracts Act parcels. The corridors for the wild and scenic rivers in the Smith River NRA would be those identified in the Smith River NRA Management Plan, and the corridors for the South Fork of the Trinity would be those established in the South Fork of the Trinity Wild and Scenic River Management Plan. See Resource Map 3 for the MKT alternative wild, scenic, and recreational river boundaries.

**Timber:** Silvicultural prescriptions and harvest intensity would be in accordance with management area direction. Timber suited portions of the general forest management area, which comprise approximately 9 percent of the Forest land base, would be managed using silvicultural strategy 1 to attain full timber yields. Silvicultural strategy 2 would be used and reduced yields would be realized from available lands with other resource emphasis, such as partial retention VQO, scenic river corridors and foraging areas for bald eagle, peregrine falcon and goshawk (approximately 11 percent of the land base). Silvicultural strategy 3 would be used and marginal timber yields would be realized from riparian reserves, harsh soil sites, goshawk nest protection zones, and designated critical habitat for the northern spotted owl occurring outside HCAs and other reserved lands (approximately 6 percent of the land base).

The allowable annual sale quantity from suitable timber lands would be 95 MMBF. Approximately 2,370 acres of mature and overmature stands would be regenerated annually in the first decade. Clearcutting would be the primary method of regeneration. An average of 1.5 snags and 3 down logs per acre would be retained in regenerated areas. To ensure reforestation success, artificial regeneration would be utilized in most areas. Natural regeneration would be emphasized in difficult to regenerate areas. Silvicultural prescriptions would be developed to maintain tree species diversity. Mixed conifer/hardwood stands would be managed to maintain a hardwood component. Full product utilization, including hardwoods and down material, would be encouraged. Table II-8 displays the timber land base acres and volumes by management area.

**Special Forest Products:** Utilization of other commercial products including fuelwood, pulpwood, Christmas trees, burls, boughs, and mushrooms would be encouraged to the extent compatible with other resource values. (Same for all alternatives)

**Pest Management:** Emphasis would be on detection and prevention of pest related damage, especially during droughts and after floods and windstorms. Pest control prescriptions would maintain management area objectives. (Same as the CUR, PRF and OGR alternatives)

**Visual Quality:** Visual quality would be maintained at the retention level in the foreground, middleground and background along all major highways and high-use recreation roads, and around recreation use areas and major bodies of water. Timber emphasis areas would be managed to comply with modification visual quality objectives. (Same as the CUR alternative)

## Environment to be Created

If this alternative were to be implemented, about 72 percent of the Forest would be allocated to uses that would exclude most land disturbance and timber management activities. Examples of such uses are research natural areas, wilderness, wild river corridors, and areas set aside for the protection of heritage resources. Because of use restrictions, these areas would remain essentially unchanged from their present condition. The current trends and rates of vegetation successional change would continue in these areas.

Approximately 28 percent of the Forest would consist of management areas that would have some regulated timber harvest, and would be roaded to some degree. Arterial and collector roads (main roads) would be distributed fairly uniformly in these management areas (see Alternative D Map); local roads would be concentrated in areas managed for timber harvest. Open road densities would be similar to current conditions.

Of this 28 percent, 10 percent of the Forest would be allocated to uses that would limit land disturbance and vegetation management activities. Examples include scenic river corridors, riparian reserves and retention visual zones. Because of the use limitations, these areas would show a limited amount of alteration of the landscape, and would appear relatively undisturbed. In total, about 80 percent of the Forest would show little or no evidence of alteration of the landscape. Motorized access would be limited in these parts of the Forest.

The remaining 18 percent of the Forest under this alternative would be available for all uses, including full yield and reduced timber management, and would be in various stages of development as a result of timber harvest and road construction activities. Modifications of the existing environment would include freshly cutover areas, temporary brushfields, young to mature conifer plantations, and additional roadcuts.

Recreation use would be the same as the CUR alternative.

## ALTERNATIVE E: ECOLOGICAL ROTATION (ECR)

### Theme

This alternative is designed to mimic natural patterns and levels of stand replacement and provide a range and distribution of habitats that emphasizes late-successional and old-growth ecosystems. Timber stand replacement through harvesting and natural disturbances would occur at a rate that is at or below natural stand replacement rates to provide large amounts of late-successional and old-growth habitat. Individual landscapes would be managed to maintain a seral stage distribution corresponding to low natural disturbance rates. Most watersheds within the available timber land base are currently below the target proportion of late-successional and old-growth forest, and many decades would be required before the target is achieved. Therefore, throughout most of the Forest, regeneration harvest would initially be limited to those late-successional and old-growth stands which provide little effective interior habitat. Intermediate harvesting would occur in young and mature stands to accelerate the development of late-successional and old-growth attributes. Like the PRF alternative, this alternative is intended to produce a managed forest landscape that would maintain stable self-sustaining populations of threatened and endangered species.

This alternative offers a very different approach to managing National Forest land. The theme of this alternative is manage over a broad land base with a light intensity to provide large amounts of late-successional and old-growth ecosystems in both reserved and matrix lands. Timber management would occur over a large portion of the Forest, although the harvest rotations would be much longer, approximately 300 years depending on site quality (these rotations are two to three times longer than would be expected with the CUR alternative). “Clearcuts” reflecting natural landscape-level forest openings with retention of live trees, snags, and logs could occur to regenerate forest stands, although their position in the landscape would be designed to maintain large contiguous patch sizes (greater than 1,000 acres in the late seral stages) and to reduce forest fragmentation. The amount of openings created in this manner would not exceed the historical replacement rate, and would be below this rate in some parts of the Forest.

This alternative would require an adjustment period before it could be implemented. Currently, many of the forest watersheds exceed the 3 percent per decade harvest rate proposed by this alternative. In these watersheds no further regeneration harvesting would be allowed until the vegetation successional stages reach the following desired percentages of the landscape:

| | | |
|---|---|---|
| Shrub/forb: | 7.5 | percent |
| Pole: | 7.5 | percent |
| Mature: | 30.0 | percent |
| Old-growth | 55.0 | percent |

The only exceptions to this would be harvesting of small, highly fragmented (surrounded by early-successional vegetation) late-successional stage patches less than 40 acres in size that by their harvest would reduce overall fragmentation in a watershed. Intermediate harvests such as thinning and individual tree selection could be used in mature stands to accelerate their development toward late-successional stand structure conditions (see silvicultural prescriptions in Appendix B). After this adjustment period to bring the landscape into an ecological rotation, the 3 percent per decade regeneration rule would apply. This means that out of approximately 494,000 acres of general forest in this alternative, 1480 acres could be regenerated a year, (Smith River NRA not being included here). Forest road densities would be similar to the CUR alternative, although this means that on some areas of steep terrain, intermediate thinnings might not be possible since access would be limited.

**Note:** fire and vegetation modeling performed between the DEIS and FEIS suggests that certain landscapes within the Forest, particularly the dry, southern areas on the Mad River District, may not be capable of attaining the above seral stage distribution due to fire regimes. Therefore, these landscapes would be managed to attain the maximum amount of late-successional and old-growth habitats that occur through natural stand replacement rates.

By creating a managed landscape that includes late-successional and old-growth ecosystems, there would be no need for special wildlife management areas such as HCAs (although HCAs are not included in the managed land base for the planning horizon). Connectivity between areas for movement of wildlife would also be provided by the use of low fragmentation prescriptions that mimic the natural process of floating large patches, the naturally occurring forest situation.

Management area designations are displayed in Table II-10 and outputs, activities, and costs are displayed in Table II-11, both at the end of this description.

Management area designations are also displayed on the Alternative E Map.

## Direction: Physical Environment

**Watershed:** Emphasize watershed stability and restoration of damaged watersheds. Watershed project priorities would be conducted to benefit riparian and wetland areas, anadromous fish habitat, and soil productivity. Revegetation efforts would use native species to the maximum extent possible.

## Direction: Biological Environment

**Sensitive Plant Species:** Endangered plant populations and their habitats would be enhanced as necessary to support recovery efforts. Viable sensitive plant populations and their essential habitats would be maintained; habitat improvement projects would be conducted as opportunities become available. (Same for all alternatives)

**Wildlife:** Endangered species would be managed according to approved recovery plans. No other land base allocations would be made to protect wildlife in the long term. Timber harvesting would not occur within northern spotted owl HCAs and nest protection zones for bald eagle and peregrine falcon. Habitat within eight peregrine falcon territories would be maintained or improved to meet the recovery target of seven nesting pairs. Habitat would be maintained or improved within six bald eagle territories to meet the recovery goal of four nesting pairs and two wintering areas.

**Riparian Zones:** Inner gorge and high and extreme landslide areas would have no regulated harvest. Areas outside inner gorge and landslide areas have riparian reserves depending on stream class. Ephemeral streams would have a 50 foot reserve each side, intermittent streams would have a 75 foot reserve, and perennial stream reserves would vary from 100 to 300 feet, depending on stream size. The riparian reserves would be managed for marginal timber yields. (Same as the CUR and MKT alternatives)

**Fisheries:** Emphasis would be placed upon protecting and maintaining stream and lake ecosystems, including streamside and riparian communities. Stream and watershed integrity would be protected by correcting road and culvert failures, controlling landslides and fine sediment sources, and maintaining sources of large woody debris for channel stability. Water quality would be protected by maintaining temperature below lethal thresholds and by addressing potential contamination problems. Stream habitat conditions would be improved by increasing the abundance and effective distribution of important instream habitat forming elements (large woody debris and boulders) through the enhancement of natural recruitment and by direct placement.

Over the first 20 years, 1/2 of the available low and medium quality habitat would be improved. Fish habitat on the Forest would be maintained through strict application of standards and guides for all designated riparian reserves, with the specific objectives of limiting potential impacts upon channel and bank stability, maintaining adequate shade canopy, and providing for recruitment of large wood into the channel. Warm water fish habitat capability would be evaluated, and improvement projects would be implemented as appropriate. Opportunities for habitat protection and improvement in resident trout streams would be investigated, particularly where recreational usage or unique characteristics indicate a special value. (Same as the CUR and MKT alternatives)

## Direction: Resource Management Programs

**Research Natural Areas:** Manage eight research natural areas and three candidate research natural areas for the research and educational values of these ecosystems.

**Special Interest Areas:** Maintain the four botanical areas designated within the Smith River National Recreation Area. The Horse Mountain and Lassics areas would be included in the general forest land base and would be managed to maintain or enhance their botanical values. (Same as the MKT alternative)

To prevent the introduction of the Port-Orford-cedar root fungus disease into uninfested areas of the North Fork Smith River Botanical Area, Forest Service Road 18N13 from the lookout site to County Road 314 would be closed to vehicle access. Non-system roads located off 18N13 from 18N09 to the lookout site would be closed. Vehicle access to remaining areas would be prohibited pursuant to 36 CFR 261.50; the prohibition would exempt officials pursuant to 36 CFR 261.50(d)(4) and persons with a permit, special-use authorization, or operating plan, as defined in 36 CFR 261.2, issued by the District Ranger or higher ranked authorized official. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

**Heritage Resources:** For project related activities, important heritage resource properties would be identified, evaluated, and protected. Heritage resources would be coordinated in accordance with the Forest-wide standards and guidelines and 36 CFR 800. (Same in all alternatives)

**Transportation and Facilities:** The Forest Transportation System will be managed for user safety and to minimize impacts on Forest resources, the landscape, and wildlife habitat. Travel and access routes will be developed for local, recreational, and administrative uses with emphasis on user safety and comfort on arterial routes. Roads will be constructed and maintained to minimum standards to accommodate planned use, prevent resource damage, and reduce road maintenance costs. New road construction will be primarily local roads, level one and two, in response to timber management access needs, with some level three collector roads constructed in response to recreational and other resource management objectives. All level one roads will be closed, and some level two roads will be downgraded to level one and closed. There will be an increase in the number of level one roads put to bed or obliterated.

Construction of local roads would continue primarily on areas of the Forest available for timber management. Road closure and obliteration would occur in most other areas to reduce wildlife disturbance, reduce potential adverse water quality effects, and reduce road maintenance costs. The overall Forest road system would increase from the present level of 2,490 roads to a maximum level 2,560 roads at the end of the fifth decade.

**Fire/Fuels**: Increase coordination with other resources (particularly ecology and wildlife) in the use of prescribed fire and wildfire management. Prescribed fire would continue with emphasis on generally achieving a lower fire intensity per acre treated and providing a wider distribution of large, down woody material.

**Lands: Uses:** New special use authorizations would be considered only when suitable private land is not available and the use would not conflict with management objectives. Uses would be consolidated as much as possible. (Same in all alternatives)

The existing Camp Six, Horse Mountain, and Pickett Peak communication sites would be designated for multi-use commercial communication sites. Use of existing undesignated single-use communication sites would continue to be authorized for minor development, resource monitoring, or government agency use. (Same in all alternatives)

**Right-of-way Acquisition:** Road and trail rights-of-way would be acquired for facilities needed for the Forest transportation system. (Same in all alternatives)

**Adjustments:** Areas identified for land exchange would be maintained in a condition that optimizes their exchange value. Priority would be given to acquiring available private lands within wilderness and the Smith River National Recreation Area and lands needed to maintain vegetative and biological diversity. Priority would be given to exchanging out of federal ownership lands that have lost their National Forest character. (Same in all alternatives)

**Landline:** National Forest property boundaries would be located, established, and maintained as necessary to protect resources and minimize conflicts with adjacent landowners. (Same in all alternatives)

**Small Tracts Act:** Small parcels of land that qualify as encroached areas or mineral fractions under the STA would be transferred into private ownership under the Act. Areas within 300 feet of the bank of a wild and scenic river would not qualify for conveyance under the STA, except as provided for in the Smith River NRA Act and the South Fork Trinity Wild and Scenic River Management Plan. (Same as the MKT alternative)

**Occupancy:** Unauthorized occupancy and use would be resolved through prompt and continuous action. (Same in all alternatives)

**Minerals:** National Forest System lands that are not withdrawn from mineral entry would be managed to encourage and facilitate development and production of mineral resources consistent with management area direction.

Reasonable conditions would be imposed in mineral extraction plans of operation to protect surface resources and to reclaim disturbed areas consistent with the statutory rights and responsibilities of operators. (Same in all alternatives)

Native American Contemporary Use Areas, Research Natural Areas, and Special Interest Areas would be recommended for withdrawal from mineral entry when further analysis determines that such withdrawal would be needed to protect them for specific management objectives.

**Range:** Range strategy 1 would be used to phase out livestock over the first decade as existing permits expire or are otherwise released by current permittees.

**Recreation:** Approximately 25 percent of sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Major facility construction would occur within the Smith River NRA during the first decade according to the Smith River NRA Plan; minor small site construction would occur elsewhere. Trails would be maintained on the average of every four years at a minimum standard. Trails management would be centered on wilderness, hiking, and OHV trails. Approximately 10 miles of trails would be constructed or reconstructed during the first decade. An OHV implementation schedule would be developed. Marketing of recreation opportunities would occur at a low level primarily directed at local markets utilizing printed media. Dispersed opportunities would be managed to maintain a semi-primitive or natural setting. Opportunities for gathering forest products would be provided. (Same as the CUR and MKT alternatives)

**Wilderness:** Opportunities would be provided for quality wilderness experiences. Wilderness would be managed to preserve wilderness characteristics. (Same for all alternatives)

**Wild and Scenic Rivers:** Designated rivers would be managed to provide quality wild, scenic and recreational river opportunities, based on the values for which they were designated. River corridors on the Klamath, Trinity and North Fork Eel Rivers would extend 300 feet from each bank without exceptions for Small Tracts Act parcels. The corridors for the wild and scenic rivers in the Smith River NRA would be those identified in the Smith River NRA Management Plan, and the corridors for the South Fork of the Trinity would be those established in the South Fork of the Trinity Wild and Scenic River Management Plan. See Resource Map 3 for the ECR alternative wild, scenic, and recreational river boundaries. (Same as the MKT alternative)

**Timber:** Use silvicultural strategy 6 to maintain vegetative and biological diversity through time on a landscape level, with a mixture of even-age management, small group selections, thinnings in mature stands to emphasize old-growth structure (thinning from above or thinning from above and below), and individual tree harvest. This alternative is characterized by long timber rotations and the maximum land base committed to commercial timber production that is consistent with the law (although at a very low intensity as compared to the “current” situation). Conduct no type conversions; manage hardwood stands for wildlife values. Conduct no salvage on unsuitable timber lands.

The allowable annual sale quantity from suitable timber lands would be 11.6 MMBF. Approximately 110 acres of late-successional and old-growth stands would be regenerated annually in the first decade. Within most regeneration areas an average of 6 large conifers, hardwoods, snags, and down logs per acre would be retained to provide structural diversity. Actual green conifer retention would range from 2 to 12 depending on such factors as incidence of disease, windthrow hazard, logging systems constraints, site regenerability, economic viability, and visual quality objective. Clearcutting would be used only where no practical alternative exists. To ensure reforestation success, artificial regeneration would be utilized in most areas. Natural regeneration would be emphasized in difficult to regenerate areas. In addition to regeneration harvest, approximately 180 acres of intermediate harvesting would occur annually in the first decade, primarily within young and early mature stands. Table

II-10 displays the timber land base acres and volumes by management area.

**Special Forest Products:** Utilization of other commercial products including fuelwood, pulpwood, Christmas trees, burls, boughs, and mushrooms would be encouraged to the extent compatible with other resource values. (Same for all alternatives)

**Pest Management:** Allow natural levels of pest activity to occur until an outbreak situation has the potential to interfere with management goals and objectives. Emphasize detection and prevention of pest-related damage, especially during droughts and after floods and windstorms. Support the primary purpose of the various management areas by providing pest control prescriptions that maintain the area's resource objectives first. Pest control or salvage prescriptions that required stand regeneration would be considered as accomplishment towards the annual ASQ.

**Visual Quality:** Partial retention VQOs would be maintained along the foreground and middleground of highways 199, 299, 96, and 36. Visual quality would be maintained at the retention level in the wild and scenic river corridors. Most of the remaining forest would be managed for a partial retention VQO.

## Environment to be Created

About 72 percent of the Forest would be allocated to uses that would exclude most land disturbance and timber management activities, such as research natural areas, wilderness, wild river corridors, and areas set aside for the protection of heritage resources. Because of use restrictions, these areas would remain essentially unchanged from their present condition. Currents trends and rates of vegetation successional change would continue in these areas. Motorized access would be limited in these parts of the Forest.

The remaining 28 percent of the land base would be managed for both timber production and wildlife habitat. Sub-marginal timber yields would be produced. Over time the landscape would consist of relatively large stands of various successional stages (seedlings/brush; saplings; poles; and young, mature, and old-growth). Most stands would be multi-species and multi-storied. The rate of stand replacement through regeneration harvest would maintain more than half of the forested land base in late-successional and old-growth stands at all times.

This 28 percent of the Forest would consist of management areas that would have at least some regulated timber harvest, and would therefore be roaded to some degree. Arterial and collector roads (main roads) would be distributed fairly uniformly in these management areas (see Alternative E Map); local roads would be concentrated in areas managed for timber harvest. The Forest road system would increase from the present level of 2,490 miles to 2,560 miles at the end of the fifth decade.

Recreation use would be the same as that in the CUR alternative.

# COMPARISON OF ALTERNATIVES

## INTRODUCTION

This section presents a quantitative and qualitative comparison of the alternatives considered in detail. It is organized as follows:

1. Narrative description, by resource, of the major differences and environmental consequences among alternatives.

2. Summary treatment of issues and concerns for all alternatives (Table II-12).

3. Comparison of acres and total standing timber volume by alternative (Table II-13).

4. Comparison of planned average annual outputs by alternative for decade 1, and potential annual outputs for decade 5 for the purpose of short and long-term comparisons (Table II-14).

5. Timber management comparisons

   a. Acreage allocation by timber yield class and alternative (Table II-15 and Figure II-2).

   b. Harvest method by alternative (Table II-16 and Figure II-3).

6. Key comparisons among alternatives (Figure II-4).

7. Summary comparison of economic effects (Table II-17).

8. Comparison of PNV and associated trade-offs and opportunity costs by alternative (Tables II-18 and II-19).

9. Average annual cash flows and non-cash benefits (Table II-20).

## MAJOR DIFFERENCES AMONG ALTERNATIVES

The following narrative highlights the major differences and environmental consequences, by environment and resource management program, among the alternatives considered in detail. Comparisons are also contained in Table II-13, Table II-14, and Figure II-4. For economic differences, see Tables II-17, II-18, II-19, and II-20. For complete details on current conditions and effects of alternatives, refer to Chapter 3, Affected Environment, and Chapter 4, Environmental Consequences, respectively.

### Physical Environment

### Water:

Alternatives vary in terms of the relative potential effects on water quality from riparian and streamcourse protection and activities such as road construction, road decommissioning, and timber harvesting. The effects on water quality are measured in terms of the number of watersheds in various condition classes.

The CUR alternative proposes the second-highest amount of timber harvesting and road construction among the alternatives; this would result in the second-highest sediment yields. Intensive timber management would be practiced on a relatively small percentage of the Forest; therefore the risk of cumulative impacts would increase on 10 to 15 of the 185 sub-watersheds on the Forest, but would decrease over the whole Forest. Watershed condition classes would improve slightly over time.

The PRF alternative proposes the largest decrease in miles of open road; this coupled with the largest decrease in acres of timber harvest makes this alternative the best in terms of water quality. Timber management would be practiced on a very small percentage of the Forest; therefore, the potential for cumulative impacts on water resources would be much less than the CUR alternative in these areas due to reduced levels of road construction and timber harvest, and an increase in watershed restoration efforts. This alternative would have the greatest improvement in watershed condition class, with more watersheds in condition class 1 and less in class 3.

The OGR and ECR alternatives have the second-lowest proposed levels of land-disturbing management, and therefore the second-lowest expected potential for effects to water quality. As these alternatives have low timber harvest levels, watershed restoration would be less than in other alternatives, but the need for improvement would also be less. Watersheds would improve in condition class over time for both alternatives.

The MKT alternatives proposes the highest levels of road construction and timber management of all alternatives. The potential for water quality impacts would also be the highest of all alternatives. Water quality for beneficial uses would be maintained or improved where watershed improvement projects could be accomplished. Watershed restoration would increase under this alternative, because funding for restoration would increase due to the relatively high level of timber harvesting. Watersheds would tend to move to higher condition classes (2 and 3), although the majority of watersheds would still be well below threshold levels.

## Biological Environment

## Biological Diversity:

The alternatives vary in terms of how they maintain ecosystem components, structure and processes. Components are expressed in terms of the distribution of seral stages in different vegetation series relative to the historic range of variability (HRV). Structure includes the retention of structural elements such as green trees, snags, and downed logs, as well as fragmentation. Processes include regeneration rates and connectivity.

**Components:** All alternatives would maintain mixed conifer in the northern zone of the Forest within the HRV. This is due to the relatively small number of acres in the red fir and white fir series available for regulated timber harvest. The acres in late seral stages would be towards the upper end of the HRV.

Under the CUR and MKT alternatives, the acres of Douglas-fir and tanoak in all seral stages would be within the HRV in all zones, but the acres in late seral stages would be towards the lower limit of the HRV. The acres in late seral stages in the mixed conifer type would be towards the upper end of the HRV in the north zone, but would be outside the HRV in later decades in the middle and south zones. This is due to the greater number of acres in the timber-suited landbase in these alternatives.

Under the PRF, OGR, and ECR alternatives, the acres of both the Douglas-fir and mixed conifer types would be within the HRV in all zones for all seral stages. The acres of Douglas-fir in late seral stages would be towards the upper end of the HRV in the north zone, and in the middle of the HRV in the middle and south zones. The acres of mixed conifer in late seral stages would be towards the upper end of the HRV in all zones; and would exceed the HRV in later decades under the PRF alternative in the south zone. This reflects the reduced timber harvest intensities in these alternatives which more closely mimic natural disturbance regimes.

**Structure:** All but the MKT alternative would use green tree retention as the primary method of regeneration. The MKT alternative would generally use clearcutting. The PRF and ECR alternatives would have the highest retention levels, comprising 15-25 percent of the area associated with the stand. The CUR and OGR alternatives would leave six green trees greater than the quadratic mean diameter of the stand. The use of green tree retention in these alternatives would provide varying levels of late seral characteristics to the regenerated stand, resulting in multi-storied uneven-aged stands. The use of clearcutting in the MKT alternative would result in even-aged stands with few late seral characteristics.

The PRF alternative would have the highest snag objectives of all alternatives, retaining an average of 80 to 100 percent of the average numbers found in mature and old-growth stands on the Forest. The OGR and ECR alternatives would leave 3-6 snags per acre depending on vegetation series and seral stage. The CUR and MKT alternatives would have the lowest snag objectives, leaving 1.5 snags per acre. This is well below the levels found currently on the Forest, and could reduce population levels of snag-dependent species in matrix areas.

The PRF alternative would have the highest coarse woody debris objectives of all alternatives, leaving 80 to 100 percent of the average numbers found in mature and old-growth stands on the Forest. The OGR and ECR alternatives would leave 4-6 logs per acre depending on vegetation series and seral stage. The CUR and MKT alternatives would have the lowest coarse woody debris objectives, leaving 3 logs per acre. This is well below the levels currently found in most late seral stands on the Forest, and could affect soil productivity as well as the number of terrestrial vertebrates dependent on coarse woody debris in matrix areas.

The PRF, OGR, and ECR alternatives would retain hardwoods as a stand component relative to their abundance in the stand prior to harvest. The CUR and MKT alternatives would retain occasional hardwoods to meet specific wildlife habitat needs.

The PRF, OGR, and ECR alternatives use silvicultural strategies which minimize fragmentation across the landscape. The CUR and MKT alternatives could result in higher fragmentation in the matrix as a result of timber harvest activities. The CUR, MKT, and ECR alternatives could increase fragmentation as a result of higher road construction levels; the PRF and OGR alternatives would decrease the number of miles of road across the Forest, and have a lower risk of fragmentation.

**Processes:** The rate of harvest in the CUR and MKT alternatives would be similar to natural disturbance rates in the south zone, but would exceed natural disturbance rates in the north and middle zones, resulting in more acres in early seral stages and fewer acres in late seral stages than would occur through natural disturbance regimes.

The OGR alternative rate of harvest would slightly exceed natural disturbance rates for Douglas-fir and tanoak in the north and middle zones, but would be much closer to natural rates than the CUR and MKT alternatives. Due to the small matrix area, the harvest rate would be similar to the HRV in all zones.

The rates of harvest in the PRF and ECR alternatives would mimic natural disturbance regimes in all zones, and would therefore result in a seral stage distrubution similar to the HRV.

The OGR alternative would have the most acreage in large blocks of reserved lands: approximately 85 percent of the Forest. The PRF alternative would have about 70 percent in large blocks. The CUR and MKT alternatives would have 60 and 55 percent, respectively, in large blocks. The ECR alternative would have 45 percent; however, the silvicultural strategies used in this alternative are expected to provide connectivity in matrix lands outside the large blocks of reserved lands.

The PRF and ECR alternatives are expected to have the most acres suitable as linkages between the large blocks of habitat and to provide the greatest amount of connectivity among the alternatives; they would be closely followed by the OGR alternative. The CUR alternative would have the second lowest acreage suitable as linkages, and would provide the second least amount of connectivity among alternatives. As the MKT alternative has the largest matrix and the most intensive timber management practices, it is expected to provide the least amount of connectivity among alternatives.

## Wildlife:

Alternatives vary considerably in terms of the acreage allocated to wildlife management and the type of timber management proposed in wildlife habitat areas. All alternatives have a high likelihood of contributing to the viability of the bald eagle, peregrine falcon, and northern spotted owl.

The CUR and MKT alternatives would use a passive adaptive management strategy which relies solely on special and managed habitat areas to provide for the viability of certain wildlife species. The timber-suited landbase outside these areas would be managed intensively for timber and other commodities and generally would not provide suitable habitat for late seral dependent species. As additional mature and old-growth dependent species become listed as threatened or endangered species, it is expected that the timber-suited landbase in these alternatives would decrease in the long-term due to the addition of dedicated wildlife habitat areas for these species. The CUR alternative proposes some travel corridors between wildlife habitat areas which would be managed for reduced timber yields. There are no proposed corridors connecting wildlife habitat areas in the MKT alternative. Both alternatives have a low likelihood of providing sufficient habitat to ensure recovery of the marbled murrelet. The CUR alternative assumes a greater risk than the PRF, OGR and ECR alternatives of not contributing to the viability of the American marten, Pacific fisher, and northern goshawk. The MKT alternative, which proposes the largest timber-suited landbase and most intensive timber management of all alternatives, may cause a displacement of breeding individuals, which would result over time in populations which are isolated and reduced below threshold levels.

The PRF, OGR, and ECR alternatives propose an “active adaptive” management strategy for managing wildlife habitat. This strategy would create a multi-storied closed canopy forest environment that is expected to maintain biological diversity while providing varying levels of commodity outputs from timber-suited lands. As additional mature and old-growth dependent species become listed as threatened

or endangered species, it is expected that the timber-suited landbase in these alternatives would remain constant in the long-term because habitat would be provided in the timber-suited landbase. The PRF alternative would rely on Late-Successional Reserves (LSRs), protection buffers, riparian reserves, and a survey and manage strategy to provide for the habitat needs of a number of species. The OGR alternative would rely on Old Growth Reserves (OGRs) and a network of managed habitat areas and corridors in the timber-suited landbase. The ECR alternative would not have distinct management areas for wildlife habitat outside HCAs and critical habitat; rather, it proposes a management strategy which manages the entire timber-suited landbase under an extended rotation which mimics natural processes and rates of change. All of these alternatives have a high likelihood of providing sufficient suitable habitat to contribute to the viability of all Forest sensitive species that are dependent on mature and old-growth forests.

## Riparian Zones:

The alternatives vary in terms of the size of riparian reserves and the intensity of activities which potentially affect the riparian resource. The primary effects from management activities are those on water quality and yield, fisheries and certain wildlife species, riparian-related aesthetics, and riparian and aquatic vegetation. The activities that can have major effects are fuels management, livestock grazing, timber management, and fish and wildlife program management.

The CUR, MKT, and ECR alternatives propose riparian reserves with 50, 75, and 100 to 300 foot buffers each side of ephemeral, intermittent and perennial streams, respectively. Parts of the riparian reserves would be available for marginal timber yields, resulting in an increased risk to the resource. Mitigations for shade canopy and bank stability would decrease the overall risk for these alternatives. The CUR and MKT alternatives have relatively higher risks of localized damage to riparian areas as a result of higher grazing levels in these alternatives. The risks of localized damage to riparian areas in the ECR alternative are low as grazing would be eliminated from rangelands during the first decade.

The PRF and OGR alternatives propose riparian reserves which would vary according to stream classification and wetland size, but could range from 100 feet each side of intermittent streams and small wetlands to 300 feet each side of perennial fish-bearing streams. There would be no regulated timber yields within the the riparian reserves. In addition, approximately 72 percent of the Forest would be within key watersheds which stress the maintenance and enhancement of riparian and aquatic resources for anadromous fisheries. This designation would increase the overall protection and maintenance of riparian zones because of their importance to fish habitat. The risk of localized damage to riparian areas from grazing would be lower than in the CUR and MKT alternatives, as grazing would remain near current levels in the PRF alternative and would be eliminated from wilderness in the OGR alternative. The PRF alternative also contains riparian reserve standards and guidelines to protect riparian areas from adverse effects of grazing.

## Fisheries:

The activities which have the most potential to affect fish habitat are timber harvesting and road construction, fire and fuels management, livestock grazing, and instream habitat improvement. The alternatives vary in their proposed level of these activities as well as their fisheries habitat management strategy.

The CUR, MKT and ECR alternatives propose riparian reserves areas which are partially managed for marginal timber yields. In addition, these alternatives have a higher level of road construction than the other two alternatives. There is an increased risk to fish habitat through both the potential removal of trees which could contribute to instream habitat, and a potential increase in sediment yields related to road construction. The MKT alternative has the highest potential for impacts from fuels treatment because of the higher fuel accumulations common in clearcutting. The ECR alternative poses a lower risk to fisheries than the CUR and MKT alternatives due to the low intensity of timber management and the emphasis on emulating natural processes.

The PRF and OGR alternatives propose a strategy of riparian reserves and key watersheds for fisheries protection. There would be no regulated timber harvest within riparian reserves. In addition, approximately 72 percent of the Forest would be located within key watersheds. The overall risk to fisheries would be very low in these alternatives because of the riparian management strategy coupled with a reduction in potentially affecting activities such as timber harvest and road construction.

## Resource Management Programs

### Special Interest Areas:

The alternatives vary in the number of proposed Special Interest Areas and the management of those areas not proposed for Special Interest Area classification.

The CUR, PRF, and OGR alternatives would manage six botanical areas and a geologic interest area to maintain their unique characteristics and provide for public use. There would be no regulated timber harvest within these areas. As the first priority for management in these areas would be the maintenance of their unique characteristics, there would be a low risk of negative impacts to these areas.

The MKT and ECR alternatives would manage the four botanical areas within the Smith River NRA to maintain their unique characteristics and provide for public use. No other areas would be nominated for Special Interest Area classification. Of the remaining areas, the Bluff Creek geologic interest area would fall within the riparian reserve management area, and there would be a low risk of negative impacts to this area. The Lassics botanical area would fall within a spotted owl HCA, and there would be a low risk of negative impacts to the area. Approximately 40 percent of the Horse Mountain botanical area would be available for timber harvest with marginal yields. The MKT alternative would have a higher risk of negative impacts to the area through timber management than the ECR alternative, as the focus of the ECR alternative is on emulating natural processes, while the focus of the MKT alternative is to produce goods with market values.

The CUR alternative has a medium to high risk of infecting stands of Port-Orford-cedar in the area thereby affecting a number of plant species associated with Port-Orford-cedar; the potential for illegal cross-country travel over gently sloping woodland areas; and the potential for degradation of plant habitat due to erosion and maintenance of water quality. As compared to the CUR alternative, the MKT alternative would moderately reduce the potential for adverse effects to the Port-Ordord-cedar plant community. As compared to the MKT alternative, the ECR alternative further reduces potential adverse effects to the Port-Orford-cedar plant community. The PRF alternative offers more protection than the ECR alternative, with a low risk of infesting stands of Port-Orford-cedar. The OGR alternative has the greatest potential for maintaining botanical area values by protecting core uninfected areas through road closures.

### Heritage Resource Management:

All alternatives provide for the identification, evaluation, protection and interpretation of heritage resources. However, the intensity of management activities which could affect heritage resources varies by alternative. Timber harvesting, road and trail construction, mining and watershed improvement are examples of activities which have the potential to impact cultural resource properties and values.

The CUR and MKT alternatives could have the greatest effects on heritage resources from potentially impacting activities on 23,650 to 25,560 acres over the next decade. The CUR and MKT alternatives could also provide for the greater identification of a greater number of cultural resources. The PRF, OGR and ECR alternatives could have the least effect because potentially impacting activities are limited to 8,070 to 11,100 acres over the next decade. However, these alternatives would allow for fewer acres to be inventoried annually; therefore, fewer cultural resources could be identified and managed for their unique values.

### Transportation and Facilities Management:

All alternatives propose some level of road construction; however, alternatives vary in the number of miles to be constructed as well as the number of miles to be decommissioned. The Forest road system currently contains 2,490 miles. The majority of road construction and obliteration will occur in the first two decades for all alternatives.

The MKT, CUR, and ECR alternatives propose a net increase in miles of road over the planning horizon. The MKT and CUR alternatives propose the highest increase, to 2,610 and 2,595 miles, respectively, by the end of the fifth decade. The ECR alternative, although it has the lowest harvest level, also has a net increase in roads to 2,560 miles; this is because the ECR alternative has the largest landbase of all alternatives. The PRF and OGR alternatives propose a net decrease in road miles, to 2,060 miles and 2,305 miles, respectively. Road miles for the OGR alternative decrease because of the limited size of the timber-suited landbase; road miles for the PRF alternative decrease because of both a small timber-suited landbase and an active road decommissioning program.

## Fire and Fuels Management:

All alternatives would require a fire and aviation management response to suppress all wildfires including those on private lands under direct Forest Service protection.

The CUR and MKT alternatives would have the highest annual level of timber-related fuels treatment, at 2,430 acres and 2,250 acres respectively. The MKT alternative is also the only alternative which uses clearcutting as the main silvicultural tool; broadcast burning and pile burning would be the main fuels treatment methods. CUR alternative treatment methods would include hand and mechanical piling and understory burning due to regeneration methods. The PRF, OGR, and ECR alternatives would have relatively fewer acres of timber-related fuels treatment, and would annually treat 390, 770, and 1,050 acres respectively.

The PRF, OGR and ECR alternatives would have increased risks of wildfire due to the emphasis on a multi-storied stand structure which would increase ladder fuels. This would be mitigated through the emphasis of natural fuels treatments. The PRF and OGR alternatives propose a net decrease in road miles; this could result in increased arrival times and wildfires; however, limited road access could also result in fewer human-induced wildfires.

## Range:

Alternatives vary according to how management techniques can affect the production and ecological condition of plant communities, and the number of animal months of livestock use made available under various management practices.

Transitory range would increase in the CUR and MKT alternatives as a result of timber harvest activities, increasing the carrying capacity for livestock and some wildlife species dependent on early seral habitat. In the CUR alternative, vacant allotments would be filled as need is demonstrated; allotments would be fully stocked in the MKT alternative. There would be more conflicts between recreational users and livestock in these alternatives. Road construction might create access to previously unsuitable rangeland, resulting in livestock drifting off permitted allotments. Under the MKT alternative, permittees would be required to install more structural improvements and provide more intensive management to maintain the ecological condition of rangelands. Implementing improvements in the CUR alternative would maintain and could improve the ecological condition of rangelands.

Livestock use would remain near present levels in the PRF alternative, and would decrease in the OGR alternative due to the elimination of livestock from wilderness areas; use in both alternatives would be well below the forage capacity produced. The AMs presently not utilized could be used to decrease pressure on primary range and offset actions required to provide protection to all rangeland resources. Road decommissioning might reduce the potential for livestock drifting off permitted allotments. Conflicts between wilderness users and livestock would continue in the PRF alternative and could increase in proportion to increases in recreational use. Riparian reserve standards and guidelines in the PRF alternative could preclude the present level of livestock use on localized sites, but should not greatly affect grazing. Implementing range improvements and other management strategies in both alternatives and maintaining current stocking rates would improve the ecological condition of rangelands. Closing wilderness to livestock in the OGR alternative would improve the ecological condition of rangelands within wilderness areas.

Livestock use of rangelands in the ECR alternative would be phased out over the first decade as permits expire. Livestock conflicts with wilderness users and other recreationists would be eliminated. Livestock would not affect riparian and aquatic habitats. Permittees would not be available to maintain water developments that would benefit wildlife. The ecological condition of rangelands would improve.

## Recreation:

Alternatives vary in terms of the types of recreational opportunities offered as well as the level of construction and maintenance of recreational facilities.

The CUR, MKT and ECR alternatives propose to rehabilitate 25 percent of the developed sites during the first decade to respond to changing user needs and accessibility requirements. Approximately 10 miles of trails would be constructed or reconstructed annually during the first decade. Trails would be maintained on the average of once every 4 years at minimum standard. Eventually, recreational facilities would not meet user expectations. Dispersed recreation use would average 580 MRVDs annually in the first decade, increasing to 810 MRVDs in the fifth decade. Developed recreation use would average 230 MRVDs

annually in the first decade, increasing to 320 MRVDs annually in the fifth decade. Designated OHV routes would increase, and would consist primarily of maintenance level II roads.

The PRF and OGR alternatives propose to rehabilitate 50 percent of the developed sites during the first decade to respond to changing user needs and accessibility requirements. Approximately 16 miles of trails would be constructed or reconstructed annually during the first decade. Trails would be maintained on the average on once every 3 years; trail management would be expanded to include management for equestrian use and mountain bikes. Dispersed recreation use would average 633 MRVDs annually in the first decade, increasing to 883 MRVDs annually in the fifth decade. Developed recreation use would average 250 MRVDs annually in the first decade, increasing to 350 MRVDs annually in the fifth decade. Staging areas to facilitate OHV use would be constructed during the first decade. Some OHV opportunities would be lost due to a decrease in the Forest's road network.

The development of recreational facilities within riparian reserves would be restricted in order to attain aquatic conservation strategy objectives in the PRF alternative, and trails would be located outside riparian reserves wherever possible to minimize effects on riparian and aquatic resources.

The CUR, OGR, MKT and ECR alternatives would have fewer areas of the Forest (15 to 18 percent) available for primitive and semi-primitive non-motorized recreational opportunities, and more areas (81 to 84 percent) available for semi-primitive and roaded natural recreational opportunities than the PRF alternative. The alternatives would have more areas (25 percent) of the Forest available for primitive and semi-primitive non-motorized recreational opportunities, and fewer areas (74 percent) available for semi-primitive and roaded natural recreational opportunities than the other alternatives. This is due to the semi-primitive non-motorized designation for most remaining roadless areas.

Motorized recreation vehicle opportunities would be foregone under all alternatives during the wet season in the North Fork Smith River Botanical Area. Opportunities for big game hunting would largely be foregone in the area. Users in the PRF, MKT, and ECR alternatives could be inconvenienced by road closures and the permit process. Loop drive opportunities would be foregone in the PRF and ECR alternatives, adversely affecting OHV users, particularly those who have historically driven the loop. Under the PRF alternative, reaching the lookout site would require a very strenuous 1.5 mile uphill walk. A number of roads in the botanical area would be closed under the OGR alternative, adversely affecting many different types of recreationists, including OHV users, hunters, and those who visit the area for its historic mining, botanic, and scenic values. To offset these effects, the Forest would provide information about the road closures and permit system, and would also post information along roads leading to access points. The Forest would identify other opportunities for OHV use in the NRA.

## Roadless and Wilderness Areas:

The alternatives vary in the number and acreage of roadless areas which would retain their wilderness attributes. None of the alternatives propose new wilderness areas.

The CUR alternative would maintain 74,240 acres in 8 roadless areas in which the wilderness attributes would be retained or only slightly altered. The PRF alternative would maintain 110,500 acres in 10 roadless areas in which the wilderness attributes would be retained or only slightly altered. In addition, 4,290 acres in 6 roadless areas would have a semi-primitive non-motorized ROS classification; the wilderness attributes in these areas could be somewhat reduced, but not eliminated. The OGR alternative would maintain 111,350 acres in 10 areas in which the wilderness attributes would be retained or only slightly altered. The MKT and ECR alternatives would maintain 65,400 acres in 6 areas in which the wilderness attributes would be retained or only slightly altered.

## Wild and Scenic Rivers:

All alternatives have the same boundary widths for the wild and scenic rivers in the Smith River NRA and on the South Fork of the Trinity River. Alternatives vary in the boundary widths for the recreational segments of the Klamath and Trinity (main fork) Rivers, and the wild segment of the North Fork Eel River.

Corridor widths would be a quarter mile from each bank of the Klamath, Trinity and North Fork Eel segments in the CUR alternative. Corridors would fall within both the riparian reserve and retention management areas, and management restrictions for these management areas would apply within the

corridors. As management within the recreational corridors would follow the more restrictive direction of the riparian reserve and retention areas, there is a low likelihood of negative impacts to these segments, and there would be no major loss of timber or other outputs as a result of the designation.

In the PRF and OGR alternatives the recreational river corridors for the Klamath and Trinity segments would follow the riparian reserve management area boundary, with exceptions for private lands, known encroached areas, and mineral fractions qualifying for STA conveyance. As the areas within and adjacent to the recreational river corridor would be in management areas with many management restrictions, there would be few risks to these river segments from having corridor widths less than a quarter mile on each side of the river. The wild river segment of the North Fork Eel would be approximately one quarter mile from each bank and would be based on viewshed considerations. The size of the wild corridor would be the largest in these alternatives; 110 acres larger than in the CUR alternative and 1,300 acres larger than in the MKT and OGR alternatives.

In the MKT and ECR alternatives all corridor widths would be 300 feet from each bank of the recreational and wild segments of the Klamath, Trinity and North Fork Eel. There would be no exception for private lands, known encroached areas, or mineral fractions qualifying for STA conveyance. There is a risk of having modified viewsheds in the ECR alternative adjacent to the recreational river corridors. The wild segment of the North Fork Eel would by the smallest in these alternatives; 1,300 acres smaller than in the PRF and OGR alternatives, and 1,190 acres smaller than in the CUR alternative. There is a risk of having modified viewsheds in both the MKT and ECR alternatives adjacent to the wild rivers corridor on the North Fok Eel as a result of the reduction in corridor width.

## Timber Management:

Timber outputs under all alternative do not meet the 1990 RPA goal. Acres available for timber production range from 87,700 acres under the PRF alternative to 264,060 acres under the MKT alternative. The determination of the suitable timber landbase depends upon the management objectives reflecting the theme of each alternative and constraints limiting or precluding timber production. The main differences among alternatives are: the acreage in special habitat, riparian reserve and managed habitat areas; the acres with visual requirements which reduce timber production; the type of timber management strategy (passive vs. active adaptive); and regeneration method used. Clearcutting is used as the primary regeneration method in the MKT alternative; all other alternatives propose regeneration methods which varying numbers of green conifers, hardwoods, snags and logs. The PRF, OGR and ECR alternatives would maintain continuous forest cover throughout the Forest. All alternatives propose a combination of even-aged and uneven-aged management, but vary in the acres managed by each method.

The allowable timber sale quantity in the CUR alternative would be 67 million board feet from 255,880 acres of timber-suited land, the second highest of all alternatives. Of this, 75,600 acres would be intensively managed for timber production. The remaining 180,260 acres would be managed for reduced yields due to other resource emphases. Approximately 2,560 acres would be regenerated annually in the first decade. Regenerated stands would retain an average of 6 large conifers, 1.5 snags, 3 downed logs and occasional standing hardwoods per acre.

The allowable timber sale quantity in the PRF alternative would be 15.5 million board feet from 87,700 acres of timber-suited land. All timber-suited land would be managed for reduced or marginal yields using an “active adaptive” management strategy. About 410 acres would be regenerated and 520 acres would be thinned annually in the first decade; regeneration would decrease and thinning would increase by the end of the fifth decade as the Forest moves towards uneven-aged management. Regenerated stands would retain at least 15 percent of the area associated with the stand as large green trees, as well as 80 to 100 percent of the level of snags and downed logs currently found in mature and old-growth stands on the Forest, and hardwoods relative to their abundance in the stand prior to harvest. Clearcutting would be used only as a last resort, and would be limited to 10 percent of regenerated stands annually.

The OGR alternative would have an allowable sale quantity of 26.5 million board feet from 122,010 acres of timber-suited land. All timber-suited lands would be managed for reduced or marginal yields using an active adaptive management strategy similar to that in the PRF alternative. About 810 acres would be regenerated and 150 acres thinned annually in the first decade. Regenerated stands would retain 6 conifers greater than the quadratic mean diameter of the stand,

as well as hardwoods, snags and downed logs. Clearcutting would be used only as a last resort.

The allowable sale quantity in the MKT alternative would be 95 million board feet from 264,060 acres of timber-suited land. Of this, 89,010 acres would be intensively managed for timber production. The remaining 175,000 acres would be managed for reduced and marginal yields due to other resource emphases. About 2,360 acres would be regenerated annually in the first decade; 2,090 of these would be clearcut, and the remaining 270 acres would be shelterwood harvested.

The ECR alternative would have an allowable sale quantity of 11.6 million board feet from 263,870 acres of timber-suited land. All of the timber-suited landbase would be managed for marginal yields under a management strategy designed to mimic natural processes. For the first five decades, timber yields would be greatly reduced as harvesting would be limited to thinnings and regeneration harvesting of fragmented mature forest patches. Harvesting could increase in the future as watersheds exceed the desired future condition of 55 percent in an old-growth condition. Approximately 680 acres would be harvested annually in the first decade. Regenerated stands would retain structural components similar to those in the PRF alternative.

## Pests:

This section discusses the effects of the alternatives relative to Port-Orford-cedar and the spread of *Phytophthora lateralis*.

The CUR and MKT alternatives propose the highest levels of road construction and timber harvesting, and have the narrowest riparian reserves. These alternatives have the highest potential for spreading the root disease. The CUR alternative would have a medium to high risk of spreading the disease into uninfected areas within the North Fork Smith River Botanical Area; the MKT alternative would have a medium to low risk.

The PRF and OGR alternatives have relatively low levels of timber harvest, and both would decrease the number of road miles on the Forest. Riparian reserves would be larger than in other alternatives, and would be reserved from timber harvest. These alternatives would provide more protection than in other alternatives. Recreation use is expected to be slightly higher than in other alternatives, thereby slighly increasing the risk due to recreation-related activities. The PRF alternative would have a low risk of spreading the disease into uninfected areas within the North Fork Smith River Botanical Area; the OGR alternative would very low risk.

The ECR alternative has slightly fewer miles of road construction than in the CUR and MKT alternatives; recreation use and riparian reserves would be the same as in the CUR and MKT alternatives. The level of timber harvest would be similar to that for the PRF and OGR alternatives, much lower than in the CUR and MKT alternatives. Overall, the potential for spreading the root disease would be higher than in the PRF and OGR alternatives, and lower than in the CUR and MKT alternatives. The ECR alternative would have a low to medium risk of spreading the disease into uninfected areas within the North Fork Smith River Botanical Area.

## Visual Quality:

Alternatives vary in the acres assigned to each visual resource objective, and the degree of change from existing to future visual condition. The existing visual quality condition index of the Forest is 50.8.

The CUR, MKT, and ECR alternatives would have a long-term visual quality index of 58.9, 58.8, and 61.0, respectively. The PRF and OGR alternatives have the highest visual quality indexes, at 62.9 and 62.7, respectively.

The CUR and MKT alternatives would maintain approximately 80 percent of the Forest with a preservation, retention, or partial retention VQO. The remainder of the Forest would have a VQO of modification. The CUR alternative would have more acres in partial retention than the MKT alternative, and slightly more acres in preservation due to the larger wild river corridor in the CUR alternative. Despite its low level of management, the ECR alternative would have a lower VQI index than the PRF and OGR alternatives because of the large acreage in the general forest area which would allow large areas of modified treatment that emulates natural changes in the ecosystem such as fire.

Nearly 100 percent of the Forest would have a VQO of preservation, retention, or partial retention in the PRF, OGR, and ECR alternatives. All of these alternatives would have the same amount of combined retention and partial retention VQO areas; the PRF alternative would have the most acres in the retention VQO and the highest visual quality index due to the smallest matrix area.

## ECONOMICS AND TRADE-OFF ANALYSIS

The following tables and narratives compare economic values and the major trade-offs among the alternatives. These comparisons are based on the following:

1. Economic effects (Table II-17),
2. Marginal cost of constraints (Table II-18),
3. PNV comparison of alternative constraints (Table II-19),
4. Average annual cash flows and non-cash benefits (Table II-20).

### Comparison of Economic Effects

Table II-17 summarizes the various economic effects of each alternative. Included is a breakdown of the total costs, cash and non-cash benefits, capital investment costs, operation and maintenance costs, and national, regional, and local costs and benefits.

Total benefits increase over the first five decades primarily because of the projected real price increase for timber. Total benefits, and the increase in those benefits, are the highest for those alternatives with the highest timber outputs. Non-cash benefits comprise 39 percent in the MKT alternative to 84 percent in the ECR alternative of total benefits for the first decade. Even though non-cash benefits increase over the first five decades, the cash benefits increase slightly more, primarily as a result of the real price increases for timber. Because of this, non-cash benefits range from 37 percent in the MKT alternative to 83 percent in the ECR alternative of total benefits in the fifth decade.

Income and employment opportunities are primarily linked to timber output. Recreation and wildlife outputs affect income and employment, as does the Forest budget. The various alternatives would cause changes in local employment ranging from a reduction of 0.05 to 57 percent.

### Present Net Value Comparison of Marginal Cost of Constraints

Table II-18 presents the economic costs of the MMR (minimum management requirement) and CEE (constrained economic efficiency) constraints; see Appendix B for an explanation of these constraints. The MMR base run contains objectives relating to maintaining viable wildlife populations (primarily species dependent on late-successional forest conditions) and vegetative diversity (HCA/LSR constraint), maintaining non-declining yields (NDY constraint), as well as dispersion and other resource protection constraints. Of these, the HCA/LSR objective has the highest cost, a $1,059 million reduction in PNV. This objective also reduces timber harvest between 310 MMBF and 110 MMBF per year during the first five decades. The NDY objective results in a $567 million reduction in PNV. The cost of both of these objectives is a result of the restrictions on timber harvest that are needed to meet the objectives. The other objectives, and any overlap among objectives, cost another $66 million and bring the total cost of the MMR objectives to $1,692 million.

In terms of both dollars and timber (or other outputs), the cost of the HCA/LSR constraint (or other constraints) applies to the benchmarks, but not necessarily to a well-balanced multiple-use alternative. In a multiple-use alternative, the above costs would be split among many benefitting resources such as visual quality, water quality, recreation, wilderness, etc.

The CEE base run differs from the MMR base run in that the Minimum Implementation Requirements (MIRs) have been added to the CEE run. The MIRs address the objectives of maintaining visual quality in the foreground and middleground of highways 299, 36, 96 and 199 and managing sensitive plants to ensure that species do not become threatened or endangered as a result of Forest Service actions. The cost of the MIRs is measured by a change in PNV. The difference in PNV between the MMR and CEE runs is $127 million.

The CEF run is the same as the CEE run except that one Forest objective common to all alternatives is added; three Native American Contemporary Use Areas (NACUAs) outside wilderness and the Smith River NRA are protected in all alternatives. The PNV and outputs of the CEF run are virtually identical to those of the CEE run, indicating that there is no significant cost in meeting this Forest objective.

### Present Net Value Comparison of Alternatives

Table II-19 presents the total PNV and the costs and benefits of the major contributing resources for each alternative. The timber resource is the major factor affecting changes in PNV, benefits and costs. While recreation makes a large contribution to PNV, the ranking of PNV is essentially determined by the timber

resource. All recreation has less influence on the PNV ranking because the costs and benefits vary less than those of timber. The ranking of alternatives by timber benefits is the same as the ranking by the first decade timber volume. Volume has a large influence on timber costs; however, other factors such as timber management practices and harvest methods also influence costs.

## Average Annual Cash Flows and Non-Cash Benefits

Table II-20 presents the total costs, benefits, and net cash flows by alternatives for decade 1 and potential for decade 2.

In every alternative timber generates at least 95 percent of the returns to the Treasury. The remaining returns are generated by recreation, fisheries, special use permits and grazing fees. In the CUR and MKT alternatives, returns to the Treasury exceed total costs, while costs exceed returns in the PRF, OGR, and ECR alternatives; this is due to the lower timber harvest levels in these alternatives.

In decade 1, the PRF, OGR, and ECR alternatives would provide lower gross returns to the Treasury than the base year level of 23.8 million. By decade 2, returns are projected to be higher than in decade 1, primarily due to projected real price increases for timber.

Net cash flow is generally correlated with returns to the Treasury. The PRF, OGR and ECR alternatives have relatively high costs, due in part to more expensive silvicultural systems.

## Summary of Reasons for Changes in PNV

The following summary discusses the changes in PNV when compared to the Constrained Economically Efficient Alternative with Forest Constraints (CEF), which has a PNV of $1,444 million. Alternatives are displayed in order of decreasing PNV. Minimum level benefits and fixed costs have been subtracted from the PNV in all alternatives in order to highlight the effect of management on the PNV.

## CEF Alternative:

PNV = $1,444 million

## MKT Alternative:

PNV = $1,181 million

Change in PNV = $263 million

**Reasons for Change in PNV:** The MKT alternative has the highest PNV of all alternatives considered in detail. There is a $263 million difference between MKT and CEF, indicating that this alternative is relatively economically efficient. The landbase for the MKT alternative is almost identical to that of the CEF alternative; as the theme of this alternative is to maximize outputs with market benefits, both the landbase and timber yields are maximized and not reduced for non-priced benefits such as visual resources and wildlife habitat.

Timber industry workers and, to a lesser extent, timber-related business and government workers would benefit under this alternative as compared to other alternatives as a result of higher income and employment opportunities. To some extent, most social groups would benefit from increased government services made possible by higher returns to the local government. At the same time, members of those groups who prefer more amenity values would incur some loss as a result of higher timber harvest levels.

## CUR Alternative:

PNV = $931 million

Change in PNV = $513 million

The primary reason for the drop in PNV between the CUR and CEF alternatives is that approximately 180,260 acres of the timber-suited landbase are managed for reduced and marginal (rather than full) timber yields in the CUR alternative for visual and wildlife habitat management purposes. These are non-priced benefits, so their value is excluded from the PNV calculations. In addition, the CUR alternative would regenerate most stands leaving a seed tree retention, while the CEF alternative uses clearcutting as the primary regeneration method.

In decade 1, the CUR alternative would provide more amenity benefits than the MKT alternative, and therefore would not benefit timber-related business as much. To some extent, most social groups would benefit from increased government services made possible by higher returns to the local government. At the same time, members of those groups who prefer

more amenity values would incur some loss as a result of higher timber harvest levels.

## OGR Alternative:

PNV = $640 million

Change in PNV = $804 million

The reasons for reductions in the PNV are the protection of habitat for late seral and old-growth dependent wildlife species, riparian areas and visual quality. These resource benefits are non-priced, and so their value is not reflected in the PNV calculations. In addition, the emphasis on intermediate harvests and regeneration methods which leave legacy structures reduces timber harvest volumes and increases timber management costs.

Recreation opportunities would be slightly higher, and the quality of recreation experience would be improved. This would benefit recreational users of the Forest as well as the service sector of the local economy. Members of those groups who prefer amenity values would benefit from increased protection for non-valued resources. Timber industry workers and those in timber-related business would find fewer opportunities for employment and income.

## PRF Alternative:

PNV = $526 million

Change in PNV = $918 million

The major reductions in PNV are similar to those for the OGR alternative, and are caused by management that would develop habitat for late seral and old-growth dependent wildlife species and protect riparian areas and visual quality. The entire timber-suited landbase would be managed for reduced rather than full timber yields in order to protect these other resources. These benefits are non-priced, and so their value is not reflected in the PNV calculations. In addition, the emphasis on intermediate harvests and regeneration methods which leave legacy structures reduces timber harvest volumes and increases timber management costs. The PNV for this alternative is lower than that of the OGR alternative because this alternative would eliminate all but 87,700 acres of the Forest from regulated timber management for the protection of these resources.

In the first decade, many Forest users would benefit from this alternative as compared to the CEF. Recreation opportunities would be slightly higher, and the quality of recreation experience would be improved. This would benefit recreational users of the Forest as well as the service sector of the local economy. Members of those groups who prefer amenity values would benefit from increased protection for non-valued resources. Timber industry workers would find fewer opportunities for employment and income. Rural development and job training programs could offset some of these effects. Forest health initiatives such as watershed restoration and fuels treatment could also provide job opportunities for displaced timber workers.

## ECR Alternative:

PNV = $438 million

Change in PNV = $1,006 million

This alternative has the lowest PNV of all alternatives considered in detail. The reason for the large reductions in PNV is that the entire timber-suited landbase of 253,870 acres is managed at extended rotations (300 years or longer). The landbase will be managed for marginal timber yields in order to protect amenity resources such as habitat for late seral and old-growth dependent wildlife species and mimic natural processes and rates of change. In addition, the emphasis on intermediate harvests and regeneration methods which leave legacy structures reduces timber harvest volumes and increases timber management costs.

Members of those groups who prefer amenity values would benefit from increased protection for non-valued resources. Timber industry workers and those in timber-related business would find fewer opportunities for employment and income.

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **1. How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?** | Reserved areas would be relied upon to maintain biodiversity. | Biodiversity would be maintained through: a system of reserved areas, a management strategy that mimics natural disturbance rates and patterns, and an aquatic conservation strategy. | Biodiversity would be maintained through a combination of old growth reserves and active adaptive management. | Same as the CUR alternative | A broad land base would be managed to mimic natural patterns and levels of stand replacement and maximize the amount of old-growth in watersheds |
| **2. What level of timber harvest will the Forest make available to help provide for the economic base of local communities?** | 67 MMRF; this ASQ could decrease over time as additional set-asides are designated for TES species. | 15.5 MMBF; this ASQ could increase in the long-term as the reliance on set-asides for TES species decreases. | 26 MMBF; this ASQ could increase in the long-term as the reliance on old-growth reserves decreases. | 95 MMBF: this ASQ could decrease over time as additional set-asides are designated for TES species. | 11.6 MMBF; this ASQ could increase in the long-term as the threshold of 55% old-growth by watershed is exceeded. |
| **3. How will the Forest manage riparian zones to help reverse the inner apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian systems?** | There would be no regulated harvest in gorge areas; buffers of 50-300' outside the inner gorge would be managed for marginal yields. | Riparian zones of 100-300' would be protected; 70 percent of the Forest would be in key watersheds; riparian reserve standards and guidelines would be implemented. | | Same as the CUR alternative | Same as the CUR alternative |
| **4. Will management activities accelerate geologic instability, and thereby degrade water quality?** | 90 percent of unstable areas would be withdrawn from most management activities. Proposed activities in remaining areas would be designed to ensure water quality maintenance. | 100 percent of unstable areas would be withdrawn from most management activities. Proposed activities would he designed to ensure water quality maintenance. | Same as the CUR alternative | Same as the CUR alternative | Same as the CUR alternative |
| **5. How will soil productivity be maintained on logged areas?** | Site-specific standards and guidelines would be implemented to prevent compaction, erosion and to maintain organic matter; and soil productivity. | | | | |
| **6. How will adverse cumulative effects on water quality be prevented?** | Regional cumulative effects methodologies would be used in conjunction with site-specific analysis to. design projects that prevent off-site effects, | The aquatic conservation strategy in conjunction with Regional methodologies and site-specific analysis would be used to prevent off-site effects. | Same as the CUR alternative | Same as the CUR alternative | Same as the CUR alternative |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **7. How will vegetative diversity be maintained Forest-wide?** | Stands will be managed to provide moderate levels of diversity elements such as snags, hardwoods and downed woody material. | The Forest would be managed to maintain a distribution of habitats within a recommended management range. Stand replacement would simulate natural stand replacement. | Stands will be managed to provide moderate to high levels of diversity elements such as snags, hardwoods and downed woody material. | Threshold levels of vegetative types and seral stages would be provided. | The Forest would be managed to maintain achieve 55% old-growth by watershed. Stand replacement would be equal or less than that of natural stand replacement. |
| **8. How will "old-growth" be preserved?** | 73 percent of the Forest would be allocated to areas which exclude most land disturbance and vegetation management activities. | 91 percent of the Forest would be allocated to areas which exclude most land disturbance and vegetation management activities; old-growth characteristics would be provided in the matrix. | 87 percent of the Forest would be allocated to areas which exclude most land disturbance and vegetation management activities; old-growth characteristics would be provided in the matrix. | 72 percent of the Forest would be allocated to areas which exclude most land disturbance and vegetation management activities. | 72 percent of the Forest would be allocated to areas which exclude most land disturbance and vegetation management activities. 55% of each watershed would be in an old-growth condition. |
| **9. How will sensitive plant populations be managed?** | Maintain viable plant populations; enhance threatened and endangered plants as necessary to support recovery efforts, with limited enhancement for sensitive species. | | | | |
| **10. How will Forest Plan allocations and their respective management prescriptions affect wildlife?** | This alternative uses a "passive adaptive" management strategy: it has a high likelihood of contributing to the recovery of the spotted owl, bald eagle and peregrine falcon; and a low likelihood of ensuring recovery of the marbled murrelet and other Forest sensitive species. | This alternative uses an "active adaptive" management strategy: it has a high likelihood of contributing to the recovery of the spotted owl, bald eagle, peregrine falcon, and marbled murrelet; and is expected to contribute to the viability of all Forest sensitive species dependent on late seral stage forests. | This alternative uses a combination of old growth reserves and an "active adaptive" management strategy: it has a high likelihood of contributing to the recovery of the spotted owl, bald eagle, peregrine falcon, and marbled murrelet; and is expected to contribute to the viability of other Forest sensitive species | This alternative uses a "passive adaptive" management strategy: it has a high likelihood of contributing to the recovery of the spotted owl, bald eagle and peregrine falcon; and a low likelihood of ensuring recovery of the marbled murrelet and other Forest sensitive species. | This alternative would manage the timber-suited landbase to maximize old-growth: it has a high likelihood of maintaining viable populations of the spotted owl, bald eagle, peregrine falcon and marbled murrelet, and is expected to contribute to the viability of other Forest sensitive species. |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **11. How should wildlife habitats on the Forest be managed?** | HCAs and eagle and falcon nests would be reserved. Critical habitat and furbearer habitat management areas would be managed for marginal yields. The Forest would not manage for wildlife habitat outside designated areas. | LSRs and eagle and falcon nests would be reserved. Timber suited lands would be managed for both timber and wildlife habitat. Forest-wide standards and guidelines would provide for the needs of a number of other species. | Large contiguous "old growth reserves" would be reserved. Timber suited lands would be managed for both timber and wildlife habitat. | HCAs and eagle and falcon nests would be reserved. Critical habitat would be managed for marginal yields. The Forest would not manage for wildlife habitat outside designated areas. | HCAs and eagle and falcon nests would be reserved. The timber-suited landbase would be managed at extended rotations to provide functional late seral stage wildlife habitat. |
| **12. How has the ecological corridor concept been treated on the Forest?** | 600 foot wide travel corridors would be managed to maintain contiguous functional habitat. | Riparian reserves would provide the foundation for travel and ecological corridors; the need for additional corridors would be assessed through landscape analyses. | 600 foot wide travel and 1200 foot wide ecological corridors would be managed to maintain contiguous functional habitat. | There would be no designated corridors. | Same as the OGR alternative. |
| **13. How will the Forest maintain or improve the quality and quantity of spawning and rearing habitat?** | Improve all low and medium quality habitat that is technically feasible to restore in the next 20 years. | Habitat will be maintained and restored by direct habitat improvement and the direction for riparian reserves, key watersheds, watershed restoration, and watershed analysis. | Habitat will be maintained and restored by direct habitat improvement and the direction for riparian reserves, key watersheds and riparian standards and guidelines. | Same as the CUR alternative | Same as the CUR alternative |
| **14. What areas will be recommended for establishment as Research Natural Areas?** | Management of the eight proposed Research Natural Areas is guided by existing National, Regional and Forest policy and would not vary by alternative. | | | | |
| **15. How will Special Interest Areas be protected?** | Six Special Interest Areas would be withdrawn from the regulated timber base and would be managed to maintain their unique values. | | | The 4 Special Interest Areas in the Smith River NRA would be managed to maintain the unique values; 2 other Areas would be included in the timber regulated landbase. | |
| **16. How will the Forest reduce the hazard to Forest users created by the illegal use of Forest land for marijuana cultivation?** | Forest law enforcement officials would continue to cooperate with various State and County agencies to prevent and eradicate illegal use of Forest lands. | | | | |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **17. What constitutes reasonable protection of Indian cultural activities and values?** | Important cultural resource properties would be identified, evaluated and protected. The Forest would work with the local Indian population to protect Indian cultural sites and activities. | | | | |
| **18. Has the Forest considered stopping new road construction and/or decommissioning existing roads?** | Over the next 5 decades, 367 miles would be constructed and 260 miles would be decommissioned for a net increase of 107 miles of road. | Over the next 5 decades, 110 miles would be constructed and 540 miles would be decommissioned for a net decrease of 430 miles of road. | Over the next 5 decades, 111 miles would be constructed and 300 miles would be decommissioned for a net decrease of 189 miles of road. | Over the next 5 decades, 381 miles would be constructed and 260 miles decommissioned for a net increase of 121 miles of road. | Over the next 5 decades, 381 miles would be constructed and 310 miles decommissioned for a net increase of 71 miles of road. |
| **19. Has the Forest designated existing and future utility corridors?** | The three existing utility corridors identified in the Western Utility Group's Western Regional Corridor Study (1992) are designated and will be managed as utility corridors. | | | | |
| **20. How should the Forest manage fire to protect and improve resources?** | Activity fuels would be treated as they are created. | An aggressive fuels treatment program would reduce fuel loadings to presuppression levels; prescribed fire and wildfire management would be coordinated with other resources to meet multiple objectives. | Emissions would be reduced to decrease air quality impacts. Low intensity burns would be emphasized. | Same as the CUR alternative | Coordinate more with other resources in use of prescribed fire and wildfire management. Total areas burned would decrease; low intensity fires would be emphasized. |
| **21. How will the effects of mining be managed?** | Exploration, development and production of Forest lands not withdrawn from mineral entry would be integrated with other resource management efforts. | | | | |
| **22. How should the Forest manage the range resource?** | Transitory range would increase as demand increases. Existing improvements would be maintained and new ones added as needed to improve distribution of livestock and resolve conflicts with other resources. | The ecological condition of the resource would be improved while providing for existing livestock use. It is expected that the demand for Forest rangelands would remain at current levels. | The ecological condition of the resource would be improved while providing for existing livestock use. Livestock grazing would be eliminated from wilderness areas. | Allotments would be fully stocked Existing improvements would be maintained and new ones added as needed to improve distribution of livestock and resolve conflicts with other resources. | Livestock grazing would be eliminated from rangelands as permits expire. |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **23. How much of the Forest will be opened to off-highway vehicles?** | There are no areas of the Forest that would be proposed for unrestricted OHV use. All use would be on designated routes. | | | | |
| **24. How many miles of trails will be constructed and maintained on the Forest?** | Approximately 10 miles of trails would be constructed or reconstructed over the next decade. Maintenance would occur on the newly constructed and existing trails every 4 years. | Approximately 16 miles of trails would be constructed or reconstructed over the next decade. Maintenance would occur on the newly constructed and existing trails every 3 years. | | Same as the CUR alternative | Same as the CUR alternative |
| **25. How will more recreational opportunities be provided?** | Major facility construction would occur within the Smith River NRA. Minor site construction would occur elsewhere on the Forest. | | | | |
| **26. How should released Roadless areas (RARE II) be managed?** | The 10 remaining roadless Areas on the Forest have been allocated to various non-wilderness management areas. | | | | |
| **27. How will wilderness be managed?** | Provide low-standard wilderness. | Provide quality wilderness | | Same as the CUR alternative | Provide quality wilderness; use of prescribed fire to maintain natural conditions. |
| **28. Should the Forest establish additional areas for wilderness management?** | As the existing and projected demand for wilderness is below current capacity, no new wilderness areas are recommended. | | | | |
| **29. Will other rivers be assessed for inclusion in the National Wild and Scenic Rivers System?** | A study was performed to determine whether additional rivers are eligible for inclusion to the National Wild and Scenic River System. Three rivers,; Blue Creek, Redwood Creek, and Red Mountain Creek, were found eligible for inclusion into the National Wild and Scenic Rivers System. These segments would be protected in a condition that would not diminish their potential for wild, scenic, or recreational classificationuntil suitability studies have been performed. | | | | |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **30. What will be the boundaries for the rivers in the Wild and Scenic Rivers System?** | Corridor widths in the NRA are those identified in the NRA management Plan; widths for the South Fork Trinity are those established in the South Fork Trinity Wild and Scenic River Management Plan. Corridor widths for other wild and scenic rivers would be 1/4 mile. | Corridor widths in the NRA are those identified in the NRA management Plan; widths for the South Fork Trinity are those established in the South Fork Trinity Wild and Scenic River Management Plan. Corridor widths for other wild and scenic rivers would follow riparian reserve and viewshed boundaries. | Same as the PRF alternative | Corridor widths in the NRA are those identified in the NRA management Plan; widths for the South Fork Trinity are those established in the South Fork Trinity Wild and Scenic River Management Plan. Corridor widths for other wild and scenic rivers would be 300 feet. | Same as the MKT alternative |
| **31. How will hardwoods be utilized?** | Hardwoods would be managed as a desired component of the Forest ecosystem. Commercial and personal use of hardwoods removed to meet resource objectives would be encouraged. | | | | |
| **32. How will the Forest protect redwood trees?** | All Redwood stands and individual trees visible from scenic outlooks would be protected. | | | | |
| **33. What plan does the Forest have to ensure the maintenance of pacific yew?** | The harvest of products from individual yew trees would be allowed only after site-specific analysis determines there would be no adverse effects to other resources, or the continuance of yew as a local species. | | | | |
| **34. Has the Forest developed a plan to control *Phytophthora lateralis* and to maintain Port-Orford cedar?** | Disease control strategies identified from experience, research, and the Region 5/Region 6 Port-Orford-cedar Action Plan would be applied to prevent or reduce the spread and severity of the disease. A risk assessment would be conducted for all projects in watersheds containing Port-Orford-cedar. Strategies for reducing the risk of infection would be integrated into all levels of planning in watersheds containing Port-Orford-cedar. | | | | |
| **35. How will the forest ensure the sustainability of special forest products while providing a source of income for local communities?** | Standards and guidelines have been established to ensure that special forest products are collected in a sustainable manner. | | | | |
| **36. How will the Forest balance the utilization of special forest products among culturally diverse cultures?** | Certain areas will be reserved for personal and traditional collection, and will be off-limits to commercial collection. | | | | |

*Table II-12. Summary Treatment of Issues and Concerns by Alternative*

| ISSUE STATEMENT | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| **37. Under what conditions should pesticides (herbicides) be used as a Forest management tool?** | The use of herbicides would be included in the full range of vegetative treatments. | Herbicides would be used as a last resort and would be hand-applied. | Same as the PRF alternative | Same as the CUR alternative. | Based on the proposed silvicultural strategies, it is expected that the use of herbicides would not be necessary. |
| **38. How much Forest scenery will appear undisturbed?** | About 80% of the Forest would have a natural or near natural appearance | Nearly 100% of the Forest would have a natural or near natural appearance | Nearly 100% of the Forest would have a natural or near natural appearance | About 80% of the Forest would have a natural or near natural appearance | Nearly 100% of the Forest would have a natural or near natural appearance |

*Table II-13. Comparison of Acres and Total Standing Timber Volume by Alternative*

| Management Area 1/, 3/ | CUR | | PRF | | OGR | | MKT | | ECR | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Acres | MMBF | Acres | MMBF | Acres | MMBF | Acres | MMBF | Acres | MMBF |
| Wilderness | 123,150 | 3,090 | 123,150 | 3,090 | 123,150 | 3,090 | 123,150 | 3,090 | 123,150 | 3,090 |
| Wild River | 14,150 | 250 | 14,260 | 250 | 14,260 | 250 | 12,960 | 230 | 14,260 | 250 |
| Expermental Forest | 1,080 | 0 | 1,080 | 0 | 1,080 | 0 | 1,080 | 0 | 1,080 | 0 |
| Humboldt Nursery | 210 | 0 | 210 | 0 | 210 | 0 | 210 | 0 | 210 | 0 |
| Research Natural Area | 6,980 | 140 | 6,980 | 140 | 6,980 | 140 | 6,980 | 140 | 6,980 | 140 |
| Native Am. Cont. Use Area | 1,140 | 10 | 1,140 | 10 | 1,140 | 10 | 1,140 | 10 | 1,140 | 10 |
| Smith River NRA Dedicated | 124,100 | 1,670 | 124,100 | 1,670 | 124,100 | 1,670 | 124,100 | 1,670 | 124,100 | 1,670 |
| Smith River NRA Managed | 59,250 | 530 | 28,360 | 250 | 42,850 | 390 | 62,010 | 610 | 67,540 | 740 |
| Special Habitat Area | 213,820 | 6,420 | 366,790 | 10,680 | 390,110 | 11,330 | 214,000 | 6,420 | 213,820 | 6,410 |
| Riparian | 100,770 | 2,650 | 141,510 | 2,980 | 90,430 | 2,370 | 101,480 | 2,670 | 101,320 | 2,670 |
| Special Interest Area | 750 | 0 | 660 | 0 | 560 | 0 | 710 | 0 | 0 | 0 |
| Special Regeneration | 47,990 | 1,370 | 34,230 | 950 | 26,150 | 700 | 39,330 | 1,120 | 0 | 0 |
| Scenic River | 1,070 | 20 | 640 | 20 | 1,080 | 30 | 370 | 10 | 1,160 | 20 |
| Retention | 16,710 | 330 | 9,030 | 180 | 11,510 | 210 | 19,440 | 390 | 0 | 0 |
| Managed Habitat Area | 95,000 | 2,920 | 2,760 | 150 | 54,360 | 1,170 | 78,160 | 1,970 | 0 | 0 |
| Partial Retention | 32,080 | 780 | 31,310 | 760 | 14,330 | 300 | 36,480 | 1,020 | 0 | 0 |
| Recreational River | Contained in Riparian Management Area | | | | | | | | | |
| General Forest | 120,410 | 2,550 | 72,480 | 1,610 | 56,390 | 1,080 | 137,090 | 3,390 | 303,930 | 7,740 |
| Total | 958,450 | 22,730 | 958,480 | 22,740 | 958,480 | 22,740 | 958,480 | 22,740 | 958,480 | 22,740 |

1/ For descriptions of Management Areas, see Chapter IV in the Forest Plan. Acreages shown here have had the overlap acres between different resource areas subtracted; see discussion in Chapter IV of the Forest Plan.

2/ This total does not include the Humboldt Nursery.

***Table II-14. Average Annual Outputs & Activities by Alternative for Decades 1 and 5***

| Output/Activity | Base | Decade | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|---|
| **Facilities** | | | | | | | |
| Total Forest Road Miles | 2,489 | 1 | 2,590 | 2,270 | 2,390 | 2,600 | 2,580 |
| | | 5 | 2,590 | 2,060 | 2,300 | 2,610 | 2,560 |
| Road Decommissioning | | | | | | | |
| Miles Decommissioned | | 1 | 10 | 25 | 12 | 10 | 12 |
| | | 5 | 2 | 2 | 2 | 2 | 2 |
| Miles of Road Construction | 50 | 1 | 20 | 3 | 2 | 21 | 21 |
| | | 5 | 3 | 2 | 3 | 3 | 3 |
| Level 1 | | 1 | 13 | 1 | 1 | 13 | 13 |
| | | 5 | 1 | 1 | 1 | 1 | 1 |
| Level 2 | | 1 | 7 | 1 | 1 | 8 | 8 |
| | | 5 | 1 | 1 | 1 | 1 | 1 |
| Level 3,4,5 | | 1 | 1 | 1 | 1 | 1 | 1 |
| | | 5 | 1 | 0 | 1 | 1 | 1 |
| Road Reconstruction | | | | | | | |
| Miles to Reconstruct | 15 | 1 | 40 | 34 | 37 | 40 | 40 |
| | | 5 | 91 | 72 | 80 | 91 | 90 |
| Road Maintenance | | | | | | | |
| Miles Maintained | 1,460 | 1 | 1,520 | 1,330 | 1,400 | 1,530 | 1,510 |
| | | 5 | 1,520 | 1,210 | 1,350 | 1,530 | 1,500 |
| **Fire** | | | | | | | |
| Total Fuel Treatment Acres | 3,670 | 1 | 3,430 | 5,390 | 3,270 | 3,450 | 3,150 |
| | | 5 | 2,640 | 5,350 | 2,640 | 2,710 | 2,640 |
| Hazard Related | 20 | 1 | 800 | 4,000 | 1,600 | 800 | 1,200 |
| | | 5 | 400 | 4,000 | 1,200 | 400 | 900 |
| Timber Related \1 | 3,610 | 1 | 2,430 | 390 | 770 | 2,250 | 1,050 |
| | | 5 | 2,040 | 350 | 540 | 1,910 | 940 |
| Other Resources | 40 | 1 | 200 | 1,000 | 900 | 400 | 900 |
| | | 5 | 200 | 1,000 | 900 | 400 | 800 |
| **Fish** | | | | | | | |
| Inventory & Survey | | 1 | 300 | 300 | 300 | 300 | 300 |
| Total Miles | 240 | 5 | 300 | 300 | 300 | 300 | 300 |
| Sport Fishing | | 1 | 7,270 | 7,270 | 7,270 | 7,270 | 7,270 |
| Total Angler Days | 9,090 | 5 | 10,153 | 10,141 | 10,141 | 10,153 | 10,153 |
| **Land Uses & Power** | | | | | | | |
| Land Acquisition (Acres) | 0 | 1 | 560 | 560 | 560 | 560 | 560 |
| | | 5 | 0 | 0 | 0 | 0 | 0 |

*Table II-14. Average Annual Outputs & Activities by Alternative for Decades 1 and 5*

| Output/Activity | Base | Decade | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|---|
| **Minerals** | | | | | | | |
| Operating Plans | 18 | 1 | 10 | 10 | 10 | 10 | 10 |
| | | 5 | 8 | 8 | 8 | 8 | 8 |
| Sand and Gravel (Tons) | 5,610 | 1 | 5,610 | 5,610 | 5,610 | 5,610 | 5,610 |
| | | 5 | 5,610 | 5,610 | 5,610 | 5,610 | 5,610 |
| **Range** | | 1 | 6,610 | 6,610 | 6,610 | 6,610 | 6,610 |
| Range AMs | 6,575 | 5 | 11,120 | 6,610 | 5,840 | 17,420 | 0 |
| **Recreation** | | | | | | | |
| Dispersed (M RVDs) | 500 | 1 | 580 | 633 | 633 | 580 | 580 |
| | | 5 | 810 | 883 | 883 | 810 | 810 |
| Developed (M RVDs) | 200 | 1 | 230 | 250 | 250 | 230 | 230 |
| | | 5 | 320 | 350 | 350 | 320 | 320 |
| Hunting (M RVDs) | 55 | 1 | 55 | 55 | 55 | 55 | 55 |
| | | 5 | 81 | 81 | 81 | 81 | 81 |
| Wilderness (M RVDs) | 25 | 1 | 25 | 25 | 25 | 25 | 25 |
| | | 5 | 40 | 44 | 44 | 40 | 40 |
| Trails | 220 | 1 | 220 | 220 | 220 | 220 | 220 |
| | | 5 | 313 | 374 | 374 | 313 | 313 |
| Trail Maintenance Miles | 75 | 1 | 75 | 75 | 75 | 75 | 75 |
| | | 5 | 78 | 125 | 125 | 78 | 78 |
| Trail Construction/ | 10 | 1 | 10 | 16 | 16 | 10 | 10 |
| Reconstruction Miles | | 5 | 6 | 11 | 11 | 6 | 6 |
| **Timber** | | | | | | | |
| Allowable Sale Quantity | | | | | | | |
| MBF | 110,240 | 1 | 67,000 | 15,500 | 26,500 | 94,999 | 11,600 |
| | | 5 | 67,000 | 15,600 | 26,500 | 95,000 | 11,600 |
| Long Term Sustained Yield | | | | | | | |
| MBF/Decade | | 1 | 70,350 | 6,100 | 27,830 | 99,750 | 22,790 |
| | | 5 | 70,350 | 7,100 | 27,830 | 99,750 | 22,790 |
| Sale Prep & Admin Acres | 3,610 | 1 | 3,320 | 9,400 | 1,250 | 3,080 | 1,680 |
| | | 5 | 5,050 | 8,500 | 1,870 | 4,900 | 1,710 |
| BD/Site Prep Acres | 4,390 | 1 | 2,430 | 19,850 | 770 | 2,250 | 1,050 |
| | | 5 | 2,040 | 19,850 | 540 | 1,910 | 940 |
| Reforestation Acres | | 1 | 2,560 | 530 | 810 | 2,370 | 1,110 |
| | | 5 | 2,150 | 480 | 570 | 2,010 | 990 |
| Replanting Acres | | 1 | 1,022 | 390 | 323 | 946 | 444 |
| | | 5 | 859 | 350 | 227 | 804 | 397 |
| Timber Release Acres | | 1 | 3,830 | 410 | 1,210 | 3,550 | 1,670 |
| | | 5 | 2,040 | 370 | 850 | 3,010 | 1,490 |
| Pre Comm. Thin Acres | | 1 | 2,300 | 164 | 730 | 2,130 | 1,000 |
| | | 5 | 1,930 | 147 | 510 | 1,810 | 890 |

***Table II-14. Average Annual Outputs & Activities by Alternative for Decades 1 and 5***

| Output/Activity | Base | Decade | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|---|
| **Water** | | | | | | | |
| Water Meeting Quality Standards | | | | | | | |
| M Acre-feet | 5,040 | 1 | 5,090 | 370 | 5,110 | 5,160 | 5,110 |
| | | 5 | 5,190 | 330 | 5,160 | 5,190 | 5,170 |
| Water Yield (M-Acre-feet) | | | | | | | |
| Total Water Yield | 5,200 | 1 | 5,200 | 0 | 5,180 | 5,200 | 5,180 |
| | | 5 | 5,190 | 0 | 5,160 | 5,190 | 5,170 |
| Increased Water Yield | 48 | 1 | 43 | 0 | 23 | 41 | 26 |
| | | 5 | 32 | 0 | 9 | 32 | 16 |
| Watershed Improvement | | | | | | | |
| Acres | 180 | 1 | 1,670 | 0 | 2,020 | 3,120 | 1,790 |
| | | 5 | 1,670 | 0 | 1,620 | 2,720 | 1,390 |
| **Wildlife** | | | | | | | |
| Wildlife User Days (MWUDS) | | | | | | | |
| Background | | | | | | | |
| Deer | 43 | 1 | 435 | 0 | 435 | 435 | 435 |
| | | 5 | 435 | 0 | 435 | 435 | 435 |
| All other except T&E | 10 | 1 | 104 | 0 | 104 | 104 | 104 |
| | | 5 | 118 | 0 | 118 | 118 | 118 |
| Direct Habitat | | | | | | | |
| Improvement Acres | | | | | | | |
| Deer | 0 | 1 | 6 | 0 | 6 | 6 | 6 |
| | | 5 | 12 | 0 | 12 | 12 | 12 |
| All other except T&E | 6 | 1 | 71 | 0 | 71 | 71 | 71 |
| | | 5 | 109 | 0 | 109 | 109 | 109 |
| Induced Habitat | | | | | | | |
| Improvement Acres | | | | | | | |
| Deer | 200 | 1 | 25,560 | 71 | 8,070 | 23,660 | 11,100 |
| | | 5 | 21,460 | 109 | 5,660 | 20,090 | 9,930 |
| All other except T&E | 2 | 1 | 23 | 0 | 23 | 23 | 23 |
| | | 5 | 44 | 0 | 44 | 44 | 44 |
| Structures | | | | | | | |
| All Species except T&E | 3 | 1 | 7 | 4,100 | 7 | 7 | 7 |
| | | 5 | 7 | 3,690 | 7 | 7 | 7 |
| T&E Animal | 1 | 1 | 2 | 23 | 2 | 2 | 2 |
| | | 5 | 2 | 44 | 2 | 2 | 2 |

*Table II-14. Average Annual Outputs & Activities by Alternative for Decades 1 and 5*

| Output/Activity | Base | Decade | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|---|
| **Total Forest Costs (M$)** | | | | | | | |
| Other Cult KV (Rehab) | $866 | 1 | $1,010 | $2 | $400 | $1,420 | $170 |
| | | 5 | $1,010 | $2 | $400 | $1,430 | $170 |
| Min. Level Costs | $4,650 | 1 | $4,720 | $0 | $4,720 | $4,720 | $4,720 |
| | | 5 | $4,720 | $0 | $4,720 | $4,720 | $4,720 |
| Setup Costs (above Min. Level) | | 1 | $2,770 | $0 | $2,770 | $2,770 | $2,770 |
| | | 5 | $2,770 | $0 | $2,770 | $2,770 | $2,770 |
| Variable Costs | $8,845 | 1 | $12,710 | $0 | $7,850 | $13,950 | $6,580 |
| | | 5 | $12,290 | $0 | $8,580 | $13,760 | $7,790 |
| Total Forest Budget (allocated) | $16,931 | 1 | $21,210 | $230 | $15,740 | $22,860 | $14,240 |
| | | 5 | $20,790 | $230 | $16,470 | $22,680 | $15,450 |
| Total Forest Budget (95 $$) | $21,096 | 1 | $26,427 | $287 | $19,612 | $28,483 | $17,743 |
| | | 5 | $25,904 | $287 | $20,521 | $28,259 | $19,251 |
| Purchaser Credit | $0 | 1 | $1,115 | $2,770 | $276 | $1,413 | $600 |
| | | 5 | $1,519 | $2,770 | $565 | $2,146 | $299 |
| Coop Moneys State | $109 | 1 | $409 | $7,150 | $409 | $409 | $409 |
| | | 5 | $409 | $7,870 | $409 | $409 | $409 |
| Coop Moneys Other Federal | $258 | 1 | $258 | $14,870 | $258 | $258 | $258 |
| | | 5 | $258 | $15,590 | $258 | $258 | $258 |
| Emergency Fire $ FFF | $698 | 1 | $698 | $18,528 | $698 | $698 | $698 |
| | | 5 | $698 | $19,425 | $698 | $698 | $698 |
| Total Forest Costs | $39,092 | 1 | $23,690 | $174 | $17,380 | $25,640 | $16,210 |
| | | 5 | $23,670 | $315 | $18,400 | $26,200 | $17,120 |
| Total Forest Costs (95$) | $48,708 | 1 | $29,517 | $217 | $21,655 | $31,947 | $20,197 |
| | | 5 | $29,493 | $392 | $22,926 | $32,645 | $21,331 |

1/ Same as BD/Site prep acres under Timber

*Table II-15. Acreage Allocation by Timber Yield Class and Alternative*

| Timber Yield Class | Alternative CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| Full Yields | 75,620 | | 0 | 89,010 | |
| Modified Yields | 71,750 | 79,070 | 93,170 | 81,040 | |
| Limited Yields | 108,510 | 8,630 | 28,840 | 94,010 | 263,870 |

*Figure II-2. Acreage Allocation by Timber Class*

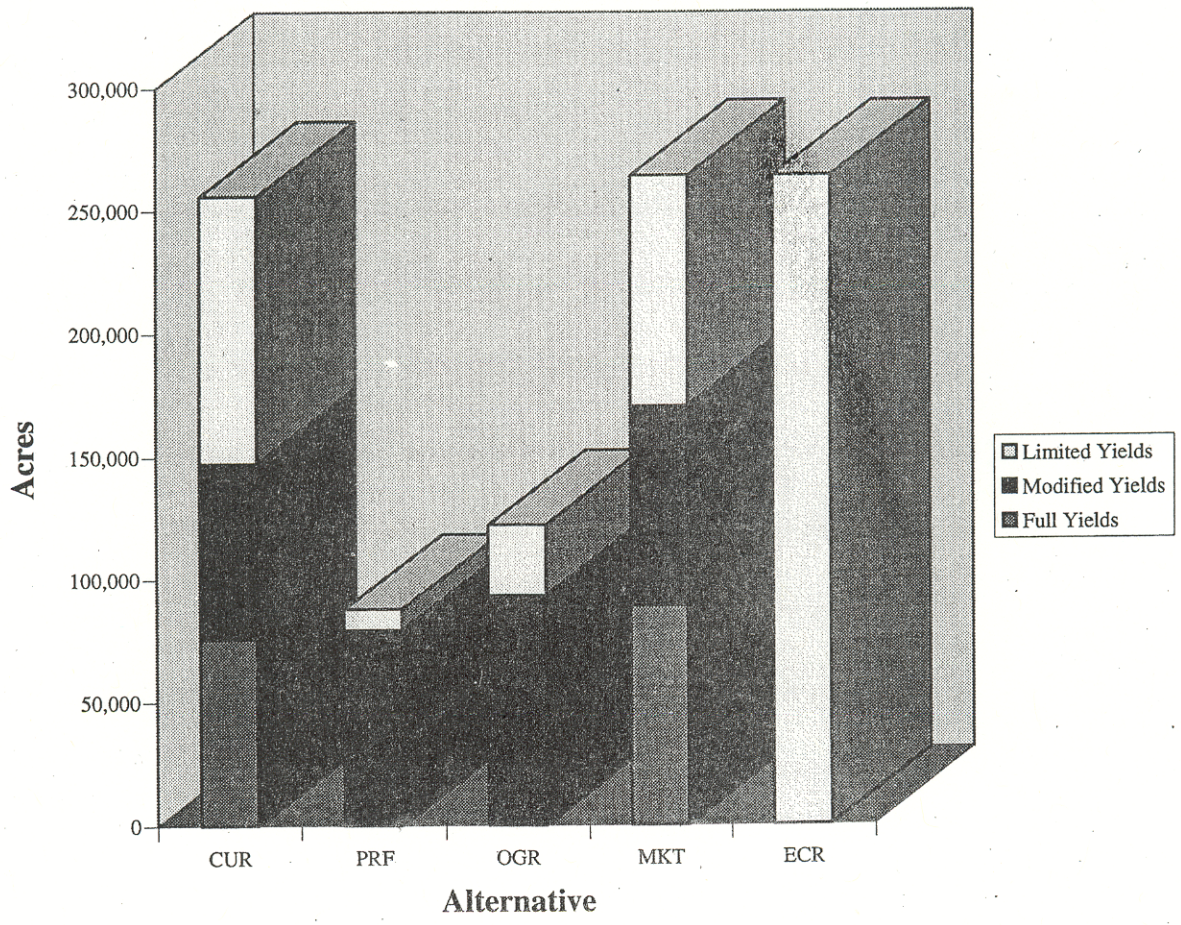


*Table II-16. Harvest Method by Alternative*

| Harvest Method Acres 1st Decade | CUR | PRF | Alternative OGR | MKT | ECR |
|---|---|---|---|---|---|
| Clear Cut | 0 | 0 | 0 | 20,890 | 0 |
| Green Tree Retention | 20,510 | 3,600 | 7,810 | 0 | 0 |
| Group Select | 5,050 | 510 | 260 | 2,770 | 11,100 |
| Commercial Thin/ Individual Tree Selection | 0 | 5,210 | 1,530 | 0 | 1,840 |

*Figure II-3. Harvest Method by Alternative*

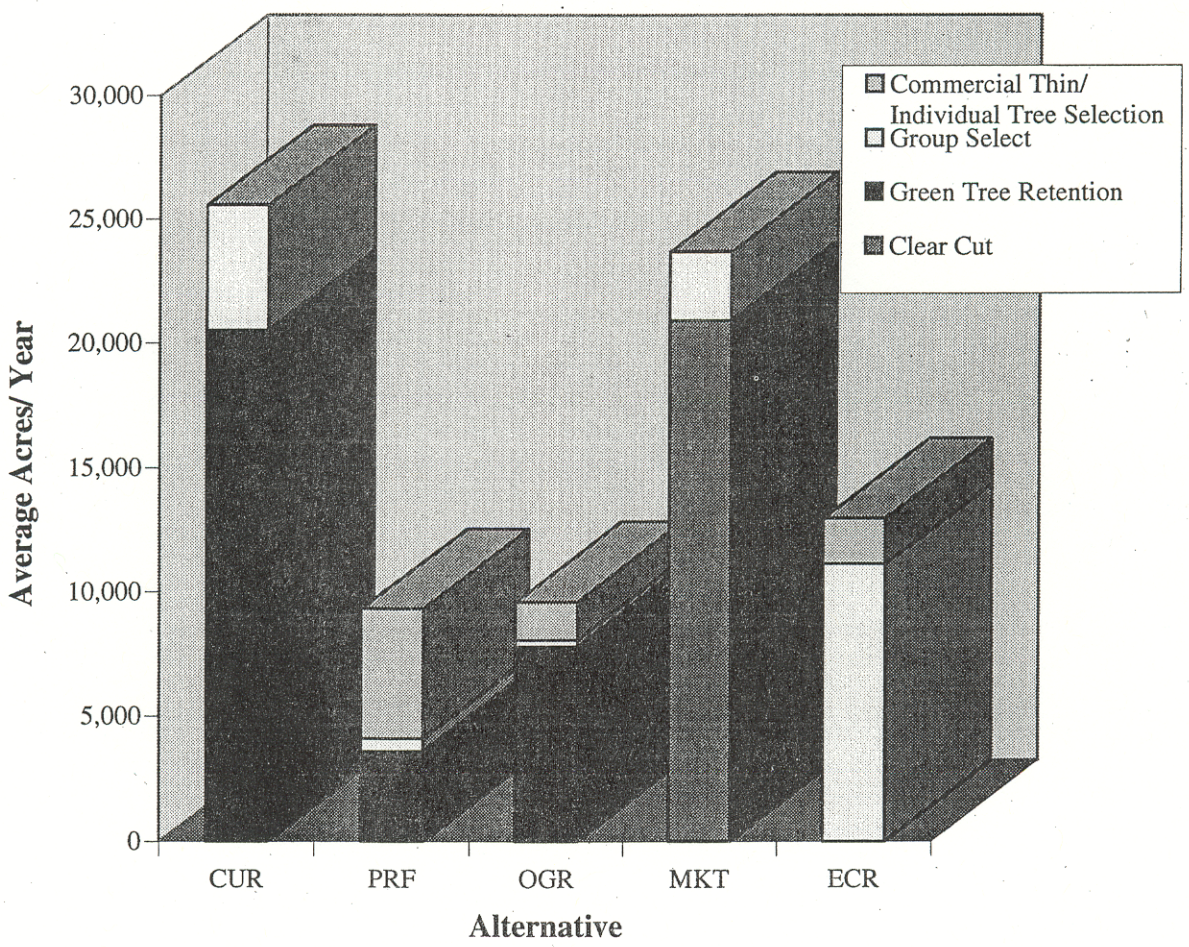
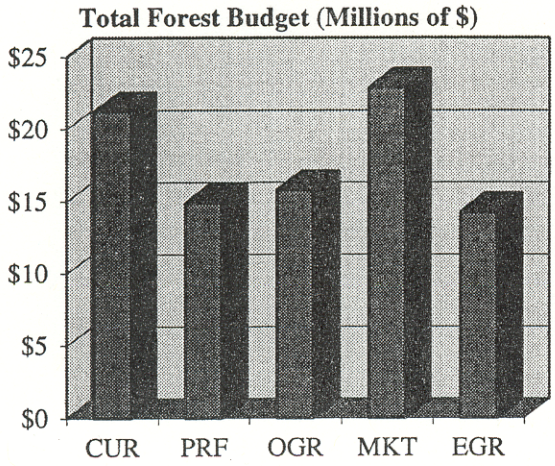
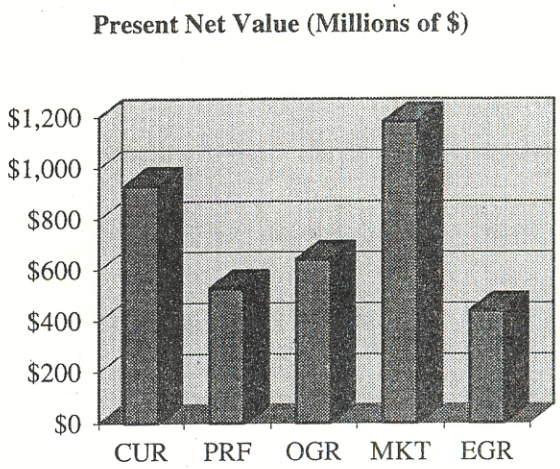
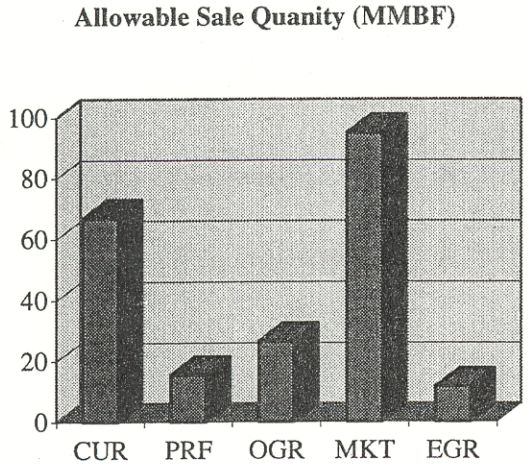
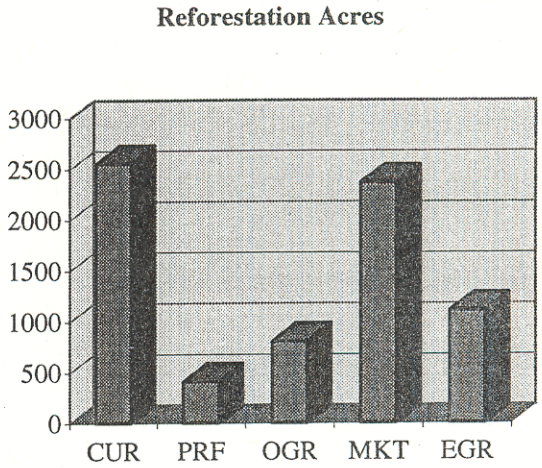


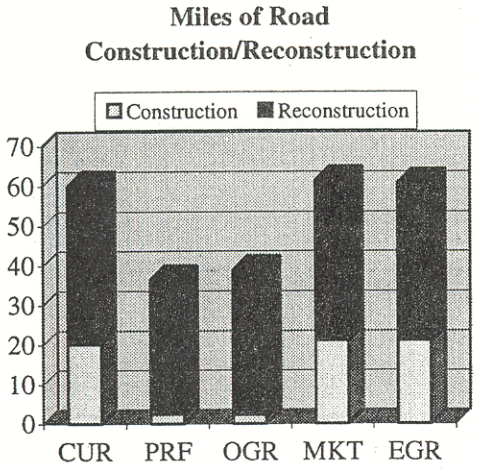
***Figure II-4. Key Comparisons Between Alternatives***



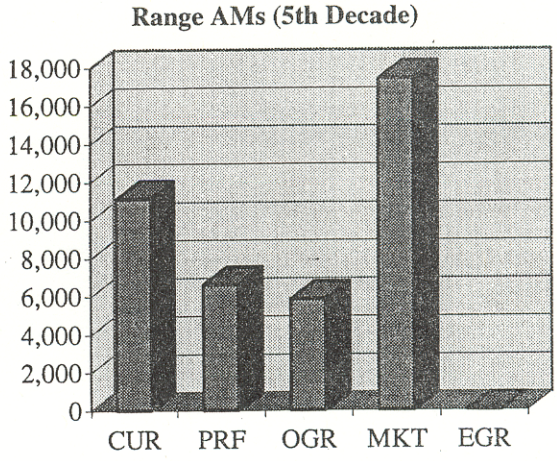



*Figure II-4 (continued). Key Comparisons Between Alternatives*

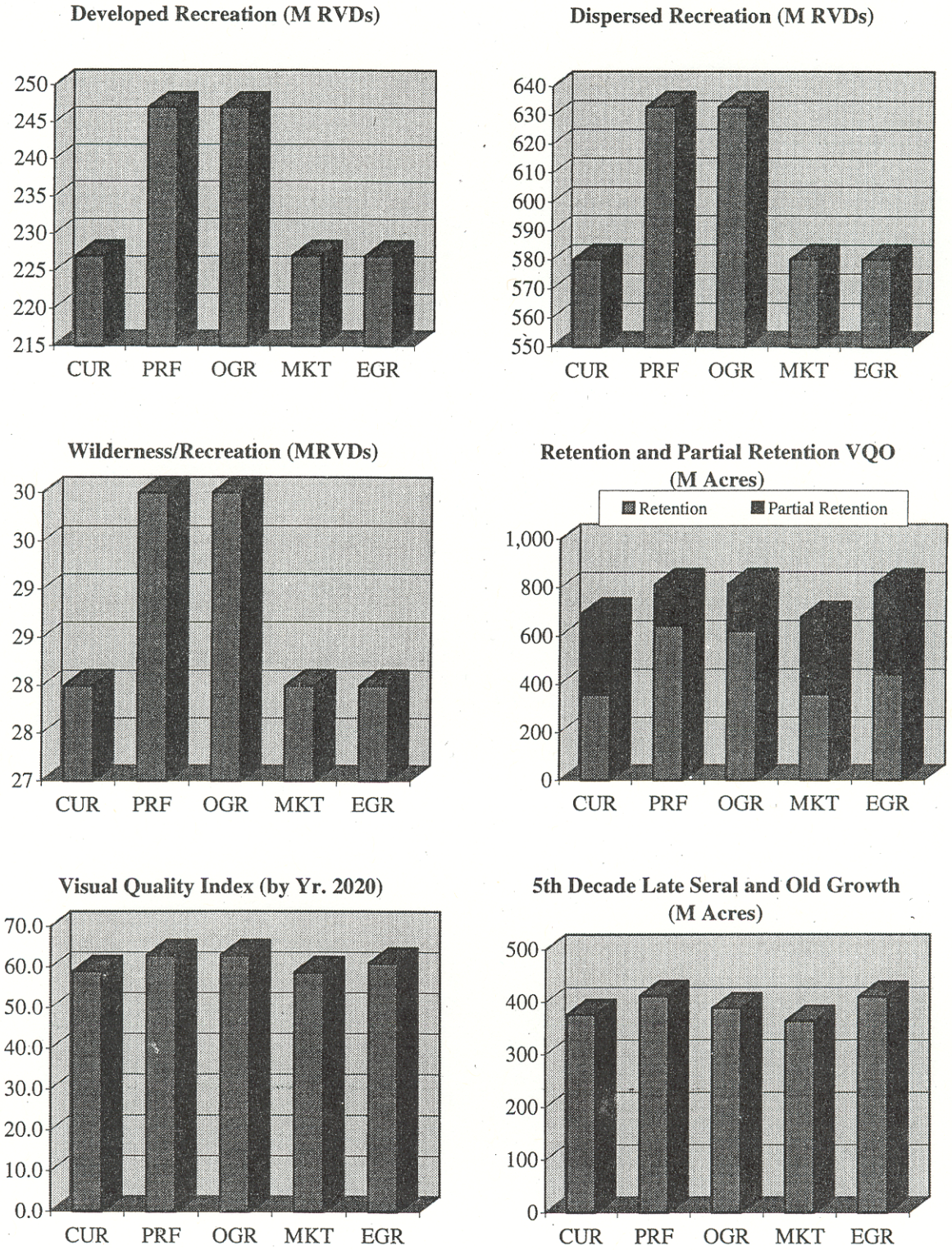


***Table II-17. Average Annual Economic Effects by Alternative***

| EFFECT | | ALTERNATIVES CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|
| | | Millions of 1989 dollars | | | | |
| 1. Total Benefits | | | | | | |
| Base Year | 66.1 | | | | | |
| Decade 1 | | 48.6 | 30.9 | 35.4 | 59.1 | 27.9 |
| 2 | | 55.2 | 35.1 | 40.2 | 67.1 | 31.5 |
| 3 | | 61.9 | 38.9 | 44.7 | 75.5 | 34.9 |
| 4 | | 69.1 | 42.9 | 49.5 | 84.6 | 38.5 |
| 5 | | 77.1 | 47.2 | 54.7 | 94.8 | 42.3 |
| 2. Returns to the U.S. Treasury | | | | | | |
| Base Year | 31.0 | | | | | |
| Decade 1 | | 25.2 | 5.6 | 10.1 | 35.7 | 4.5 |
| 2 | | 28.7 | 6.4 | 11.5 | 40.6 | 5.1 |
| 3 | | 32.6 | 7.3 | 13.1 | 46.2 | 5.8 |
| 4 | | 37.1 | 8.3 | 14.9 | 52.6 | 6.5 |
| 5 | | 42.2 | 9.5 | 17.0 | 59.8 | 7.4 |
| 3. Non-Cash Benefits | | | | | | |
| Base Year* | 35.1 | | | | | |
| Decade 1 | | 23.4 | 25.3 | 25.3 | 23.4 | 23.4 |
| 2 | | 26.5 | 28.7 | 28.7 | 26.5 | 26.5 |
| 3 | | 29.2 | 31.6 | 31.6 | 29.2 | 29.2 |
| 4 | | 32.0 | 34.6 | 34.6 | 32.0 | 32.0 |
| 5 | | 34.9 | 37.7 | 37.7 | 34.9 | 34.9 |
| 4. Total Costs | | | | | | |
| Base Year | 18.7 | | | | | |
| Decade 1 | | 23.7 | 16.4 | 17.4 | 25.6 | 16.2 |
| 2 | | 22.6 | 17.0 | 18.1 | 29.4 | 16.6 |
| 3 | | 24.0 | 17.1 | 18.5 | 25.6 | 17.0 |
| 4 | | 22.8 | 17.2 | 18.1 | 25.8 | 17.1 |
| 5 | | 23.7 | 17.3 | 18.4 | 26.2 | 17.1 |

1. Total benefits include both cash returns to the U.S. Treasury and non-cash benefits. Total benefits are the estimated total amount that consumers would be willing to pay for Forest outputs, whether or not this amount is actually collected by the U.S. Government.
2. Returns to the U.S. Treasury are the estimated payments by consumers of Forest outputs collected by the Federal Government.
3. Non-cash benefits are the difference between the total estimated amount that consumers would be willing to pay for Forest outputs and actual collections by the Federal Government. At present, it is National policy to provide many Forest outputs either at no charge to consumers or at a charge less than the total willingness to pay value.
4. Total costs include the Federal and non-Federal costs needed to produce Forest outputs.

*Table II-17. Average Annual Economic Effects by Alternative (continued)*

| EFFECT | | ALTERNATIVES CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|
| | | Millions of 1989 dollars | | | | |
| 5. Non-Federal Cost | | | | | | |
| Base Year | 0.1 | | | | | |
| Decade 1 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 2 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 3 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 4 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 5 | | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 6. Federal Cost | | | | | | |
| Base Year | 18.6 | | | | | |
| Decade 1 | | 23.3 | 16.0 | 17.0 | 25.2 | 15.8 |
| 2 | | 22.2 | 16.6 | 17.7 | 29.0 | 16.2 |
| 3 | | 23.6 | 16.7 | 18.1 | 25.2 | 16.6 |
| 4 | | 22.3 | 16.7 | 17.7 | 25.4 | 16.7 |
| 5 | | 23.3 | 16.9 | 18.0 | 25.8 | 16.7 |
| 7. Total Budget | | | | | | |
| Base Year | 17.1 | | | | | |
| Decade 1 | | 21.2 | 14.9 | 15.7 | 22.9 | 14.2 |
| 2 | | 19.9 | 15.3 | 16.3 | 26.3 | 14.8 |
| 3 | | 21.2 | 15.4 | 16.6 | 22.1 | 15.3 |
| 4 | | 19.9 | 15.5 | 16.2 | 22.3 | 15.4 |
| 5 | | 20.8 | 15.6 | 16.5 | 22.7 | 15.5 |
| 8. 25% Receipt Shares | | | | | | |
| Base Year | 7.7 | | | | | |
| Decade 1 | | 6.3 | 1.4 | 2.5 | 8.9 | 1.1 |
| 2 | | 7.2 | 1.6 | 2.9 | 10.2 | 1.3 |
| 3 | | 8.2 | 1.8 | 3.3 | 11.6 | 1.4 |
| 4 | | 9.3 | 2.1 | 3.7 | 13.2 | 1.6 |
| 5 | | 10.6 | 2.4 | 4.2 | 15.0 | 1.9 |

5. Non-Federal costs include all costs paid by non-Federal cooperators (such as State Fish and Game habitat improvement expenditures; range capital investments made by the permittee).
6. Federal costs are all costs borne by the Federal Government. This includes costs paid from general tax receipts, costs paid from funds set aside from receipts (such as KV funds) and costs paid by accepting in-kind payments in lieu of cash (such as purchaser road credits). Federal cost also equals total cost less non-Federal cooperator cost.
7. Total budget is equal to Federal cost less the cost of fighting forest fires (FFF) and funding contributed by other Federal agencies.
8. Twenty-five percent of returns to the U.S. Treasury are distributed back to the counties in proportion to the Six Rivers National Forest's acreage in each county.

**Table II-17. Average Annual Economic Effects by Alternative (continued)**

| EFFECT | | ALTERNATIVES CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|---|
| | | Millions of 1989 dollars | | | | |
| 9. County Yield Tax Revenues | | | | | | |
| Base Year | 0.9 | | | | | |
| Decade 1 | | 0.7 | 0.2 | 0.3 | 1.0 | 0.1 |
| 2 | | 0.8 | 0.2 | 0.3 | 1.2 | 0.1 |
| 3 | | 0.9 | 0.2 | 0.4 | 1.3 | 0.2 |
| 4 | | 1.1 | 0.2 | 0.4 | 1.5 | 0.2 |
| 5 | | 1.2 | 0.3 | 0.5 | 1.7 | 0.2 |
| 10. Discounted Benefits | | 1516.9 | 953.2 | 1094.3 | 1851.5 | 860.1 |
| 11. Discounted Costs | | 586.0 | 427.0 | 454.2 | 670.2 | 422.2 |
| 12. Present Net Value | | 930.9 | 526.3 | 640.1 | 1181.3 | 437.9 |
| 13. Income per year | | | | | | |
| Base Year | 64.4 | | | | | |
| First Decade | | 50.9 | 29.7 | 33.9 | 61.2 | 27.5 |
| 14. Employment per year | | | Person Years | | | |
| Base Year | 2321 | | | | | |
| First Decade | | 1835 | 1070 | 1222 | 2207 | 990 |
| 15. Benefit/Cost Ratio | | 2.6 | 2.2 | 2.4 | 2.8 | 2.0 |

9. Under California law, a yield tax currently equal to 2.9 percent of timber harvest value is levied on timber purchasers.
10. Discounted benefits over the planning horizon (150 years).
11. Discounted costs over the planning horizon (150 years).
12. Total discounted benefits less total discounted costs.
13. Estimated total personal income resulting from Forest operations including wages, salaries, proprietor's income, and rents for the Forest's zone of influence (Humboldt, Del Norte, and Trinity Counties).
14. Estimated total employment generated by Forest operations in the zone of influence.
15. Total discounted benefits divided by total discounted costs.

***Table II-18. Present Net Value Comparison: Marginal Cost of Constraints (MM$)***

| Analysis | PNV | Change in PNV 1/ | Disc Cost | Change in Disc Cost | Disc Bene-fits | Change in Disc Benefits | Discounted Benefits 2/ Timber | Rec 3/ | Fish | Other | Discounted Costs 2/ Timber | Rec 3/ | Fish | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLW: Max PNV | 3,252 | | 1,366 | | 4,618 | | 3,658 | 710 | 127 | 123 | 926 | 38 | 42 | 360 |
| HCAs/LSRs | | -1,059 | | -393 | | -1,452 | | | | | | | | |
| NDY | | -567 | | -240 | | -807 | | | | | | | | |
| TES | | -66 | | -21 | | -87 | | | | | | | | |
| MMR | 1,571 | | 700 | | 2,272 | | 1,312 | 710 | 127 | 123 | 358 | 38 | 42 | 262 |
| SIAs, Visual Constraints & Critical Habitat | | -127 | | -50 | | -178 | | | | | | | | |
| CEE | 1,444 | | 650 | | 2,094 | | 1,134 | 710 | 127 | 123 | 309 | 38 | 42 | 261 |
| Minus all but naturally occurring background levels. | | -1,296 | | -459 | | -1,754 | | | | | | | | |
| MLV 4/ | 148 | | 191 | | 340 | | 0 | 248 | 90 | 1 | 0 | 7 | 0 | 185 |

1 All Changes are measured incrementally, starting from the PNV of FLW base run, which does not include the MMR's

2 Direct comparisons between individual benefit and cost categories may be misleading because many outputs have common costs of production that cannot be reliably separated and attributed to individual resources.

3 Recreation includes developed, dispersed, hunting-related dispersed, and wilderness recreation.

4 The minimum level benchmark shows naturally occurring background benefit and fixed costs associated with maintaining the Forest in federal ownership.

**Key**

PNV = Present Net Value

FLW = Max PNV with MMR constraints minus non-declining yield, Viable population and Diversity constraints.

HCA's = Constraints recommended by Interagency Scientific Committee to protect Spotted Owls

NDY = Non-declining Yield Constraint

TES = Other T&E or sensitive species including Goshawk, Bald Eagle, & Peregrine Falcon

MMR = (Minimum Management Requirements) are included in MMR, and CEE, runs, but not in FLW.

**Table II-19. Present Net Value Comparison of Alternatives (MM$)**

| Analysis | PNV | Change in PNV 1/ | Disc Cost | Change in Disc Cost | Disc Bene-fits | Change in Disc Benefits | Discounted Benefits 2/ Timber | Rec 3/ | Fish | Other | Discounted Costs 2/ Timber | Rec 2/ | Fish | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CEF | 1,444 | | 650 | | 2,094 | | 1,134 | 710 | 127 | 123 | 309 | 38 | 42 | 261 |
| | | 263 | | -20 | | 242 | | | | | | | | |
| MKT | 1,181 | | 670 | | 1,852 | | 1,134 | 710 | 5 | 3 | 325 | 30 | 45 | 271 |
| | | 250 | | 84 | | 335 | | | | | | | | |
| CUR | 931 | | 586 | | 1,517 | | 800 | 710 | 5 | 2 | 243 | 30 | 42 | 271 |
| | | 291 | | 132 | | 423 | | | | | | | | |
| OGR | 640 | | 454 | | 1,094 | | 319 | 768 | 5 | 2 | 92 | 52 | 37 | 273 |
| | | 114 | | 27 | | 141 | | | | | | | | |
| PRF | 526 | | 427 | | 953 | | 178 | 768 | 5 | 2 | 59 | 52 | 36 | 281 |
| | | 88 | | 5 | | 93 | | | | | | | | |
| ECR | 438 | | 422 | | 860 | | 144 | 710 | 5 | 1 | 86 | 30 | 36 | 271 |

1 All Changes are measured incrementally, starting from the PNV of CEF base run, which includes the Forest Minimum Implementation Constraints.
2 Direct comparisons between individual benefit and cost categories may be misleading because many outputs have common costs of production that cannot be reliably separated and attributed to individual resources.
3 Recreation includes developed, dispersed, hunting-related dispersed, and wilderness recreation.
4 The minimum level benchmark shows naturally occurring background benefit and fixed costs associated with maintaining the Forest in federal ownership.

**Key**
PNV = Present Net Value
CEF = Constrained economic efficiency with Forest Constraints.
MKT = Market alternative, Maximize market outputs.
CUR = Current Alternative
PRF = Preferred alternative
OGR = Old growth Reserve
ECR = Ecological Rotation

*Table II-20. Average Annual Cash Flow and Non-Cash Benefits (Millions of 1989 Dollars)*

| | DECADE 1 | | | | DECADE 2 | | | |
|---|---|---|---|---|---|---|---|---|
| Alt | Net Cash Flow | Total Federal Cost | Returns To Treasury | Non-Cash Benefits 1/ | Net Cash Flow | Total Federal Cost | Returns To Treasury | Non-Cash 1/ Benefits |
| CUR | 1.9 | 23.3 | 25.2 | 23.4 | 6.5 | 22.2 | 28.7 | 26.5 |
| PRF | -10.4 | 16.0 | 5.6 | 25.3 | -10.1 | 16.6 | 6.4 | 28.7 |
| OGR | -6.8 | 17.0 | 10.1 | 25.3 | -6.2 | 17.7 | 11.5 | 28.7 |
| MKT | 10.5 | 25.2 | 35.7 | 23.4 | 11.7 | 29.0 | 40.6 | 26.5 |
| ECR | -11.3 | 15.8 | 4.5 | 23.4 | -11.1 | 16.2 | 5.1 | 26.5 |

1/ Non-cash benefits are the difference between the total estimated amount that consumers would be willing to pay for Forest outputs and actual collections by the Federal Government. At present, it is National policy to provide many Forest outputs either at no charge to consumers or at a charge less than the total willingness to pay value. (Any discrepancies are due to rounding).

# Affected Environment

## INTRODUCTION

### PURPOSE

This introductory section provides general information about the organization of the chapter and the forest setting.

### CHAPTER ORGANIZATION

The “Physical Environment” section discusses the basic elements of the Forest that provide the setting for its biological resources. The “Biological Environment” section discusses the Forest’s plant and animal resources and the aspects of those resources which the Forest Service is directed to manage. The “Social and Economic Environment” section discusses those aspects of the Forest environment that tie together the physical and biological components of the Forest with resource management programs, which are discussed in the “Resource Management Programs” section. Each of these four sections of the chapter is divided into various components which are further broken down into four or five main areas of discussion as described below.

#### Public Issues

This area identifies any issues relating to the resource component that were identified by the public. They include the three issues that are driving the development of alternatives for the Land and Resource Management Plan and the other issues that are listed in Chapter 1 for further discussion in this document.

#### Introduction

This area introduces the resource or program and may identify issues that are expected to emerge during the planning period.

#### Current Situation

This area describes the existing environment, trends, characteristics, and historic costs and receipts where appropriate.

#### Opportunities

This area describes the opportunities for management and potential areas for conflict that may occur within the planning period.

#### Affected Environment in Context with Alternatives

This area identifies the part of the document where discussion of issues, management concerns, and the environmental effects is completed.

Discussion Completed in Chapter 3: Discussion is completed in this chapter if the potential effects of the various management alternatives on the resource are similar for all alternatives and the issues are not used to weigh the relative merits of the various alternatives. The effects of the issues completed in Chapter 3 are minimal, mitigated and/or outside the scope of this EIS. The potential effects of management activities will be addressed through watershed, program, or similar analysis and, prior to project implementation, through the project-level NEPA (National Environmental Policy Act) process.

Discussion Completed in Chapter 4: Issues that lead to further differences in management direction, standards and guidelines, land allocations, or environmental consequences among the alternatives are discussed in Chapter 4, Environmental Consequences.

FOREST SETTING

The landscape of the Six Rivers National Forest is composed of extensive stands of coniferous forest in a rugged, mountainous setting. Moderate amounts of oak woodland and grassland are located in the southern part of the Forest along with small isolated patches of chapparal. Because of this topography and vegetation, the Forest has historically been used mostly for timber production, grazing, mining, dispersed recreation, fishing, and hunting.

Three mountain ranges are present on the Forest: the North Coast Range, the Salmon Mountains, and the Siskiyou Mountains. Elevations on the Forest range from near sea level on the west to just under 7,000 feet along the eastern Forest boundary. Most of the Forest is in the 60 percent or greater slope class.

The broad topographic features of the Forest have been shaped by prehistoric glacial activity (at higher elevations, on north-facing slopes) and large-scale landslide activity. Recent geologic events have included widespread uplift at comparatively high rates. The relatively large number of landslides, debris slides, and earthflows on the mountain slopes are clearly related to the rapid downcutting by streams in response to this rapid uplift.

The Forest has a Mediterranean climate with cool wet winters and warm dry summers. Rainfall is the principal form of precipitation, with at least 90 percent occurring during the months of October through May. Snow is common at higher elevations. The average precipitation varies from about 40 inches per year at Ruth Lake to 190 inches per year at Ship Mountain (the highest rainfall in the State).

The Forest is traversed by about 1,500 miles of permanent streams. Four of the 6 major rivers on the Forest originate primarily within the Forest boundaries: Smith, Mad, Van Duzen, and North Fork of the Eel. In general, these rivers are short in length, are unregulated, and flow directly into the Pacific Ocean. The Trinity and Klamath rivers originate, respectively, east and northeast of the Forest. These six rivers are among the largest rivers in California; the Forest's watersheds supply about 9 percent (5.21 million acre-feet) of California's total runoff. The majority of the run-off occurs during the winter; the low-elevation mountains in this area do not build up sufficient snowpack to sustain high streamflows into mid-summer.

Ruth Reservoir (Mad River Ranger District) is the only large impoundment on the Forest, created by Matthews Dam on the Mad River in 1962. In addition, over 60 small natural lakes and ponds occur on the Forest, concentrated primarily on the Orleans and Lower Trinity Ranger Districts.

## PHYSICAL ENVIRONMENT

### GEOLOGY

#### Public Issues

Issue 4 Will management activities accelerate geologic instability, and thereby degrade water quality?

The following areas are related to the Forest's geologic environment but are discussed in other sections of this chapter: management activities allowed in riparian management areas (see Riparian Zones section); cumulative watershed effects of repeated entry into a given drainage; effects of forest management activities on beneficial uses of water (see Water section); and protection of sensitive (special interest) areas (see Special Interest Area section).

#### Introduction

The Forest has a complex geologic structure and history. It is underlain by a variety of rock types, most of which have been changed by geologic heat and pressure. Much of the bedrock has been sheared and weakened by faults and fractures. Igneous rocks such as peridotite, gabbro, and diorite, as well as linear zones of serpentine (the State mineral), also occur on the Forest. Some north-facing slopes at higher elevations show evidence of glacial activity.

The recent geologic history of the Forest has been governed by widespread uplift of the earth's crust at comparatively high rates (2-6 centimeters per century) in this region. The large number of landslides on the mountain slopes are the result of rapid downcutting by streams through weak bedrock and overlying surface materials in response to this rapid uplift.

#### Current Situation

Landslides and Slope Stability: Management activities that modify natural slope conditions can increase landslide activity above natural levels. Numerous published and unpublished studies during the past 15 years on the Forest have shown that logging and road construction can increase mass erosion and sedimentation rates substantially on lands identified as having a high or extreme landslide susceptibility (Furbish and Rice, 1983). The resulting sedimentation can degrade a large fraction of the downstream fish habitat in some cases (Farrington and Savina, 1977). Substantial economic losses from damage to the road system have also been incurred where roads have been located on geologically sensitive lands.

Landslide hazard classes have been defined and mapped throughout the Forest because of the geologic sensitivity of some parts of the Forest landscape and the need to use special management practices in these areas. The process used to develop landslide hazard maps is documented in the

planning records. Hazard areas were delineated on the basis of the geologic resources inventory (GRI), using 1:16,000 aerial photos and limited field checking. The maps are on file at the Supervisor's Office, Six Rivers National Forest. The hazard classes delineate areas of relative landslide susceptibility from timber harvesting and road-building activities. About 180,000 acres (19 percent of the Forest) are designated as high or extreme landslide hazard. Over 90 percent of the high and extreme hazard areas occur adjacent to stream channels on slopes steeper than 65 percent. These two hazard classes include valley inner gorges (Figure III-2), recently active landslides, the downslope toe zones of dormant landslides, and fault zones of weakened bedrock with slopes over 65 percent. Geologic hazard areas are continually updated by field investigations during intensive project planning.

Groundwater: Bedrock of the Klamath Mountains and Coast Range has a low potential for development of large groundwater supplies. Cracks in the rock that could hold and transmit groundwater are generally tight and often have been sheared by geologic forces. Therefore, the rock has relatively little pore space containing water and does not yield it readily to wells. Most surface materials contain a wide range of particle sizes including silt and clay, so they are not very permeable and only yield small quantities of water.

Groundwater use is limited to small domestic supplies developed for campgrounds or administrative sites. Localized springs and seeps have been developed by means of horizontal wells or spring boxes to provide from two to five gallons per minute. Drilled bedrock wells have generally not been productive on the Forest. Moderate groundwater supplies could probably be developed in some of the relatively thick, more uniform sand and gravel deposits along parts of the Trinity and Mad rivers, but this resource has not been extensively evaluated or exploited within the Forest.

Earthquakes & Volcanic Hazards: The Klamath Mountains and Coast Range provinces consist of earth crustal blocks and linear belts of varying composition separated by ancient faults, nearly all of which are considered inactive. The major active faults in northwest California are offshore in the vicinity of Six Rivers National Forest. They include the northern segment of the San Andreas fault system and the Mendocino Fracture Zone, which are about 20 miles west of the Forest. These have generated historical earthquakes in the range of Richter Magnitude 4.0 to 7.0+. The effects of these earthquakes on the Forest have been greatly reduced because of their distance from the Forest. The possibly active Grogan Fault traverses the southwestern section of the Forest in the headwaters of the Eel and Mad rivers. Associated earthquakes within the Forest boundary have been infrequent and of low magnitude (4.0 to 5.0+). Further north, in Del Norte County and offshore, historic earthquakes have been more frequent but of similar magnitude. There are no volcanic hazards on the Forest.

In view of this moderate earthquake history, there is little potential for adverse environmental effects on minor engineered structures such as frame buildings, road embankment fills, and water systems (tanks, pipes). The only major engineered structure within the Forest boundary is Matthews Dam impounding Ruth Lake, which was constructed under the jurisdiction of California Division of Dam Safety regulations and is unlikely to be adversely affected by potential earthquake activity.

Earth Construction Materials: Various geologic materials are used for engineering projects on the Forest, including select borrow for road fills, unprocessed rock surfacing, crushed rock surfacing,

crushed rock for pavement, and large construction stones (rip-rap). Rip-rap and pavement rock have been supplied from both commercial and Forest sources, whichever were the most economical. The other products have been adequately supplied from sources distributed throughout the Forest.

Construction material use has tended to diminish from several hundred thousand cubic yards per year in the mid 1970s to the present use of a few tens of thousand cubic yards per year. This trend is likely to continue because of fewer miles of road construction as the system is completed and lower road standards needing smaller capital investments such as aggregate.

Geologic Interest Areas: The complex geologic history of the Forest has produced an equally complex distribution of interesting geologic materials and features, including bedrock structures and landforms. These geologic interest areas are discussed in this chapter in the Special Interest Areas portion of the Resource Management Program section.

Opportunities

Some aggregate for surface replacement will be needed in the future; quantities will depend on the volume of timber hauled and the performance of existing road surfacing. Present inventoried sources of construction materials on the Forest, plus likely non-inventoried sources, should be adequate for the next 50 years.

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on geology and geologic instability are essentially the same for all management alternatives and are not discussed further in Chapter 4. The potential effects of specific projects on geologic instability will be considered during the project-level NEPA process.

## SOILS

Public Issues

Issue 5 How will soil productivity be maintained on logged areas?

Introduction

Soil is a fundamental resource on the Forest. Soil supplies water and nutrients for vegetation and provides habitat for microorganisms and wildlife. Soil moderates water runoff by absorbing and storing water and releasing it slowly over time. All renewable resources of the National Forest are dependent upon soil. Soil is the balance wheel of the ecosystem and is the oldest and most important component of the forest system. Soil is considered a nonrenewable resource because of the length of time required for soil formation (tens to hundreds of thousands of years).

Current Situation

Soil Distribution: Soils on the Forest are diverse with respect to soil type and productivity. Soil diversity is due to Forest-wide variability of physical and environmental conditions influencing soil formation. These variable factors include parent material (rock type), topography (landform shape and slope), biology (plants and animals), climate, and variation in land stability which influences the time that soil has had to develop.

The soils of the Forest are classified into five orders: entisols, inceptisols, alfisols, ultisols, and mollisols (Soil Taxonomy, Agriculture Handbook 436, USDA 1975b). The soils of greatest extent on the Forest are entisols and inceptisols, which are relatively young. The older, more developed, soils (alfisols and ultisols), while not as extensive, include some of the most productive land on the Forest. The Forest has some soils unique to the continental United States. These are the deep red lateritic soils that occur in the North Fork of the Smith River watershed, developed from serpentine-type rocks. They are thought to be at least one million years old and are similar to the very old and highly weathered soils found in the tropics.

Soil Productivity: About 84 percent of the Forest's soils are rated as capable of growing trees for industrial wood (a minimum growth rate of 20 cubic feet of wood fiber per acre per year). Soils of the Forest have been further grouped into productivity classes, based on potential stand growth (Figure III-3).

The productivity of the soils varies according to soil depth, soil porosity, soil available water, nutrient status, soil organic matter, soil biology, and site characteristics including elevation, slope, and aspect. Soils having stand growths greater than 120 cubic feet per acre annually generally are deep (greater than 40 inches), have loam to clay loam textures with low rock content (less than 35 percent), and have high organic matter content and high water-holding capacities. Soils rated as having stand growths of 85 to 120 cubic feet per acre annually generally are moderately deep (20 to 40 inches), have loam textures with moderate rock content (25 to 50 percent), and have moderate water-holding capacities. Soils rated less than 85 cubic feet per acre annually generally are shallow (less than 20 inches), have loam or coarser textures with high rock content (greater than 50 percent), and have a very low water-holding capacity. Soils can also be low in productivity because they are infertile or have a nutrient imbalance, such as on soils derived from serpentine.

Erosion Hazard: Based on the erosion hazard rating system, the Six Rivers NF Order III soil survey (1980) determined that about 20 percent of the Forest soils have a very high erosion hazard rating if the vegetation and duff are removed. The erosion hazard rating system is a relative numerical rating system that considers the major soil and environmental factors important for soil erosion. Despite the high erosion hazard ratings, high rates of surface erosion (rilling and gullying) do not usually occur on this Forest. This is due in part to the following factors:

1. The moderate to strong surface soil structure which is resistant to breakdown by raindrop impact;
2. High water infiltration rates;
3. Residual soil cover from duff, litter, slash, and surface rock fragments;
4. Rapid regrowth of vegetation after disturbance.

Notable exceptions are the highly erodible soils derived from dioritic rock and South Fork Mountain schist.

Soil Survey: Several levels of soil surveys have been and are being done on the Forest. The Forest Order III soil resource inventory was completed in 1980. It is a reconnaissance level soil survey used for broad level planning and does not provide sufficient detail for site-specific project planning. About 10 percent of the Forest has been surveyed at the Order II level (medium intensity). This level of survey is intended for watershed level planning. Because of the variability of soils on the Forest, even this level of soil survey is not detailed enough for site-specific project planning. Therefore, on-the-ground site investigations are completed to ensure accurate soil information is used for project planning.

Management Considerations: Management activities have the potential to reduce soil productivity by:

1. Increasing soil erosion and mass wasting;
2. Mechanical displacement of soil from the site;
3. Reducing soil porosity through compaction and puddling;
4. Reducing site organic matter (large organic debris, litter, duff, and soil organic matter);
5. Depletion of soil nutrients by removal of nutrient bearing organic debris, by volatilization from burning, and by leaching;
6. Removing soil from productive uses for roads, buildings, and other administrative uses.

Soil loss through erosion, mass wasting, or displacement can have the most dramatic effect on productivity. Increased erosion and mass wasting remove topsoil from the site. If erosion is increased beyond the rate of soil formation, long term productivity can be lowered. Mechanical displacement acts the same as soil erosion in that it removes topsoil from the site.

Compaction reduces the ability of plant roots to penetrate the soil and take up water and nutrients. Studies have shown that seedling growth on compacted soils can be reduced as much as 50 percent. Compaction can occur at any time of the year, but soils are most susceptible when wet. The effects of compaction are long term. Soils can remain compacted for as long as 40 years. Other factors affecting soil susceptibility to compaction are soil texture and structure and the amount and type of surface pressure and surface litter.

Soil organic matter directly affects both water and nutrient holding capacity as well as soil tilth. Organic matter holds many times its weight in water and increases the soil's ability to hold nutrients. Organic matter can lessen adverse physical effects such as compaction. Organic debris (in the form of leaves, needles, and twigs) supplies nutrients as it decomposes. Large woody material (whole down, rotting logs) supports the life cycle of symbiotic soil fungi that attach to conifer roots and greatly increase the tree's ability to take up nutrients and water. Duff and litter on the soil surface act as mulch and reduce soil erosion. Management activities that displace soil or burn organic debris have the greatest potential adverse effect on soil organic matter.

Opportunities

Maintenance of soil productivity is important to ensure the continued health of Forest ecosystems, as well as a productive land base to grow timber and forage products for future generations. Soil is considered a non-renewable resource in relation to a human time scale because of the extremely long time required for it to develop.

The Pacific Southwest Region of the Forest Service (Region 5 ) has developed soil quality standards that set the maximum acceptable levels for soil compaction and minimum levels of litter, duff, and large organic debris to be left after logging and site preparation. The quality standards address prevention of soil compaction, soil erosion, maintenance of organic matter, and monitoring the soil resource. These standards are applied site specifically through the interdisciplinary process used during project design (see standards and guidelines in the Forest Plan).

Critical areas are identified during sale area layout. Specific measures to prevent degradation of the soil are incorporated into the environmental assessment for each project. Examples of preventive measures for soils susceptible to compaction may be to rip (mechanically fracture to subsoil depth) the soil after the management activity occurs to a small area, or change the management practice so that compaction does not occur. Exact prescriptions depend on the specific circumstances.

Monitoring is conducted to review compliance with and effectiveness of soil quality standards so that adjustments can be made if problems with implementation or effectiveness are evident (see monitoring plan in Chapter 5 of the Forest Plan).

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on soil productivity are discussed further in Chapter 4. The potential effects of specific projects on soil productivity will be considered during the project-level NEPA process.

WATER

Public Issues

Issue 6 How will adverse cumulative effects on water quality be prevented?

Introduction

Cumulative effects are the sum of the effect on the environment of specific actions over time. The issue here is the potential adverse effect of repeated logging operations in a watershed, which at some point can degrade water quality.

Current Situation

We estimate that 15 percent of the surface waters on the Forest have a high sediment load resulting from the cumulative effect of Forest Service management activities and the Christmas flood of 1964. Other surface and groundwater on the Forest is high quality.

Water is essential to aquatic and riparian ecosystems, wildlife habitat, and fish habitat. Forest water is a focus of recreation activities such as boating, camping, and fishing. Forest water also provides domestic, agricultural, and industrial water supply for residents and communities in the Forest's primary zone of influence, Del Norte, Humboldt, and Trinity counties.

Precipitation and Streamflow: Six major rivers flow through or arise in the Forest: the Smith, Klamath, Trinity, Mad, Van Duzen, and Eel. These rivers account for over one-quarter of the total runoff in California. The Forest watersheds alone account for about nine percent (5.2 million acre-feet) of California's total runoff (see Table III-1).

Although the total runoff is remarkably high, it is unevenly distributed throughout the year. As much as 98 percent of the total annual water yield occurs from November through May. Stream runoff is mainly from rainfall. Snowmelt makes up only a minor part of the total Forest runoff. The summer months are usually dry.

Average annual rainfall varies from 52 inches at Lower Trinity Ranger Station to 151 inches at Camp Six in the Smith River National Recreation Area (NRA). The highest annual rainfall recorded in the continental United States occurred on the Forest during the winter of 1981-82 when Camp Six near Gasquet received 254.9 inches of precipitation. In one 3 day period, a Forest Service rain gauge at Ship Mountain received 45 inches of rain, which is also a national record. The monthly distribution of precipitation and streamflow is given for a typical Forest watershed in Figure III-4.
Steelhead and resident trout populations can be severely restricted by summer low flows. During the 1977 drought, resident trout populations above Ruth Lake dropped to very low numbers. The recovery of the population has taken many years.

The water supply for downstream domestic and agricultural users usually is not limiting. Exceptions to this were in 1977 and 1991 when Eureka and Arcata asked residents to voluntarily reduce their water usage. Rainfall in 1991 was the lowest on record for Eureka (1878-1991). There are no active plans by state or federal agencies to export water off the Forest to areas outside the primary zone of influence.

There are no major flood control structures on the Forest. Although Ruth Dam (Mad River) provides some flood protection, the primary function of the reservoir is to provide a water supply for the Eureka/Arcata area and pulp manufacture on the Samoa peninsula. There are no major floodplains on the Forest.

The Forest presently has water rights for approximately 400 acre-feet per year filed with the state (less than one tenth of one percent of the Forest's total runoff). This is used for timber harvest (dust abatement), range (watering troughs), and recreation and administrative sites (domestic use). Use is not expected to increase significantly by the year 2000.

Water Use: The primary uses of water from the Forest are for municipal and domestic supply, fisheries (including salmon and steelhead), agriculture, industrial use (including a large pulp mill), recreation (including wild and scenic rivers), hydropower generation, and maintenance of riparian ecosystems and Forest biodiversity. The pulp mill at Samoa accounts for a large proportion of the industrial and municipal use on the Mad River. There are 24 municipal-class watersheds on the

Forest. These are defined as having a water system which services at least 15 service connections, or serves 25 people for 60 days or more per year.

The Forest has no formal municipal watershed agreements; therefore, none of the Forest watersheds have specific management prescriptions for the express purpose of protecting domestic water supplies. However, the water use is a primary consideration when developing Best Management Practices (BMPs) prescriptions for protecting water quality (see BMP in the glossary).

Water Rights: The Six Rivers National Forest is subject to state laws governing water rights and uses, with the exception of water uses covered by the Forest Reservation principle (silvicultural practices, fire protection, and domestic use for facilities needed to manage the Forest). The Forest has filed appropriate notices with the State Water Resources Control Board for its reserved, riparian, and foreseeable uses and has obtained licenses for its appropriated uses.

Sedimentation and Water Quality: Forest management activities have the potential to adversely affect water quality. Sediment is the primary water pollutant on the Forest. Excessive sediment in a stream can degrade spawning gravels and fill pools, limiting fish reproduction and rearing habitat. Sediment also affects the taste and odor of drinking water. Past natural events, such as the 1964 flood, and disturbances resulting from management activities like logging and road construction have increased erosion and sedimentation. Increased landsliding and increased temperatures of cold water streams associated with road building and logging are the Forest's predominant concerns. Landsliding causes sedimentation, and loss of streamside shading can increase water temperatures above the range that supports healthy populations of anadromous fish. Sediment and increased temperatures are referred to as "nonpoint source" as they do not come from single, discrete places, but rather from many places. Control strategies for nonpoint source pollution focus on controlling practices that generate pollutants such as sediment and heat. The use of "Best Management Practices" that are designed to limit nonpoint source pollution is the heart of the approach to this kind of pollution as prescribed by the federal Clean Water Act.

The 1964 flood had a major influence on Forest streams. The flood triggered many landslides in both developed and undeveloped areas, which aggraded many of the stream channels. Many of these landslides are still active today. The watershed and stream conditions on the Forest have since been improving, however. Accumulated sediments are being transported out of the streams, pools are reforming, riparian vegetation is reestablishing itself, and landslides are stabilizing. A flood of this magnitude has a statistical recurrence interval of about 100 years. Each year, there is about a one percent chance of such a flood occurring.

Cumulative Effects: The effects of management activities on water resources can be cumulative. A cumulative impact is the impact which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Farrington and Savina (1977) observed a situation on the Forest in which a number of logging and road-related landslides in the streamside inner gorge increased sedimentation, causing the stream channels to aggrade (accumulate sediment and detrital material). This caused the stream channel to meander laterally and erode downstream channel banks. In some areas the bank-cutting triggered

additional landslides, which added more sediment to the stream channel, causing more bank cutting and landsliding. The cumulative sediment input exceeded the stream's ability to carry the sediment. By exceeding this "sediment threshold," additional bank cutting and landslides were created downstream away from the primary disturbance sites. This type of negative feedback, however, is not the only form of cumulative effect to water quality. All effects to water quality, whether local or far downstream can be regarded cumulatively when the context of the receiving waters and beneficial uses is fully considered.

Watershed analysis as directed by the FSEIS ROD (the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl [ROD] associated with the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl [FSEIS]) requires an extensive description of the conditions in a watershed, showing the context of conditions and processes on important uses and values in the watershed. While a watershed analysis is not a cumulative effects analysis in itself, it will provide most of the information on which to base a cumulative effects analysis and show what resources and processes the analysis should focus on. It is clear that the "watershed scale" (20 to 200 square miles) is most appropriate for evaluating and mitigating cumulative effects. Watershed analysis will help to ensure that the processes that lead to cumulative effects are understood as best we can, and that important effects are discovered and used in decision-making.

At the site scale, where most effects to water quality originate, rigorous implementation of best management practices is what matters in avoiding cumulative effects. Studies have shown that most erosion and water quality degradation can be prevented by properly locating and constructing roads, landings, and cut units. A study by Rice (1980) on logging and erosion found that more than 90 percent of the erosion they measured occurred on only 4 of the 103 sites studied. On those 4 sites, the erosion was caused by poor landing placement, poor road drainage, excessive soil disturbance, and poor location of a cut block. On all of these sites the potential for erosion could have been foreseen and prevented.

Opportunities

Watershed Improvement Inventory: There are some areas on the Forest that are producing sediment and high water temperatures that are degrading fish habitat. Some of these degraded areas were acquired through land exchange, while others have been degraded as a result of past poor logging and roading practices, livestock over-grazing, mining activities, and natural events. The Forest currently has a watershed improvement needs inventory completed for the highest priority areas on the Forest (approximately 209,000 acres). Priority is based on the beneficial uses of the stream, particularly as anadromous fish habitat. Though inventories are incomplete, and some might need updating, about 450 sites (2,200 acres) were identified as needing restoration (reduce erosion rates, provide streamside shading, and restore healthy riparian ecosystems). Additional inventory is ongoing, with additional high priority watersheds scheduled for inventory within the next 5 years.

Many of these degraded areas can and are being restored or improved by revegetation of landslide faces and riparian areas, correcting road drainage, removing eroding stream crossings, and protecting streambanks. Restoration plans either exist or are being developed for Grouse Creek, Pilot Creek, Willow Creek, Madden Creek, the Horse Mountain Mine area; and, as part of the

National Recreation Area legislation, many of the tributaries of the Smith River watershed. In the past, restoration work has been accomplished throughout the Forest (approximately 150 acres per year) with larger projects in Quartz Creek, South Siskiyou Fork, Knopki Creek, Bluff Creek, Willow Creek, Hurdygurdy Creek, Grouse Creek, Madden Creek, Salt Creek, and Pilot Creek. Monitoring of the restoration work is ongoing and varies in intensity, from occasional visits and photography, to intensive monitoring for downstream cumulative effects.

### Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on water quality are discussed further in Chapter 4.

Figure III-5. View of typical Forest stream showing healthy riparian habitat on the Six Rivers National Forest.

## AIR

### Public Issues

Air quality was not identified as an issue or concern during the public scoping process, but it has been included here because of the related issue of concern regarding prescribed burning as a fuel treatment method and its potential effect on air quality and human health.

### Introduction

The Clean Air Act of 1963 (42 U.S.C. 1857 et sec.) was amended in 1977 and 1990. The Act requires that management activities on the Forest meet all substantive and procedural requirements of the applicable federal, state, and local standards or regulations. The Act is administered by the State of California Air Resources Control Board which has local jurisdiction through Air Quality Management District offices.

Section 176(c) of the Clean Air Act requires the Forest Service (as a federal agency) to document that its proposed management activities, whether implemented by the agency or other entities, conform to the applicable State Implementation Plan (SIP). A SIP is a State's plan for attaining and maintaining ambient air quality standards. None of the SIPs are finalized at this time. "Conformity" means that our management activities shall not:

cause or contribute to any ambient air quality violations
increase the frequency of any existing violations
impede the States' progress in meeting their air quality goals

Management activities that may be affected by conformity include prescribed burning, fuelwood permits, road construction, building construction, oil and gas leasing decisions, and ski areas.

In late November of 1993 the U.S. Environmental Protection Agency (EPA) released its rules on conformity of general federal actions involving emissions of pollutants to SIPs. EPA was required to promulgate these criteria and procedures for federal agencies' compliance with the requirements of the Clean Air Act. Although Clean Air Act Section 176(c) applies to all federal activities regardless of their location, EPA's recent rules apply only to activities occurring in "non-attainment" or "maintenance" areas. These are areas that are presently, or were previously not attaining the ambient air quality standards. EPA is working on rules to address activities occurring in all other areas of each state.

An air pollutant factor of particular interest to human health is PM10, that is, particulate matter less than 10 microns in size. (For comparison purposes, a human hair is approximately 70 microns in size.) Airborne particles larger than 10 microns get trapped by the body's normal defense mechanisms and are expelled from the body. PM10 bypasses these defenses and remains lodged deep in the lungs. Detrimental health effects of PM10 can include asthma attacks, reduced lung function, aggravated bronchitis, respiratory disease, cancer, and possible premature death. Immediately affected by PM10 emissions are the elderly, children, asthmatics, and people with chronic heart or respiratory disease. Long term exposure would have more widespread detrimental effects.

Current Situation

The Six Rivers National Forest falls within two air basins - the North Coast and the Northeast Plateau (Figure III-6). The majority of the Forest is in the North Coast Air Basin (under the jurisdiction of the North Coast Unified Air Quality Management District), with only one percent of the total land area in the Northeast Plateau Air Basin (under the jurisdiction of the Siskiyou County Air Quality Management District).

These districts have regulatory and licensing authority for stationary sources of pollutants, such as mills, and prescribed burning (as opposed to vehicular pollutants). Air quality in both basins is generally considered good, with all Federal standards consistently achieved (including those for ozone, carbon monoxide, particulate matter, and nitrogen dioxide). California state standards for PM10 have not been met. Preliminary results of a source monitoring study by the North Coast Air Quality Management District has attributed substantial amounts of PM10 to sea salt and to auto emissions, with smoke being a minor contributor.

The Forest Service is responsible for protecting values and resources affected by air quality, such as visibility and vegetation, in Class I areas. Class I areas were designated by Congress and include all Wildernesses greater than 5,000 acres, and all National Parks and National Memorial Parks that exceed 5,000 acres and which were in existence upon enactment of the 1977 Clean Air Act amendments. Activities on the Forest have a potential to affect two Class I areas, the Marble Mountain Wilderness located on the Klamath National
Figure III-6.

Northern California Air Basins

Forest and the Yolla Bolly-Middle Eel Wilderness shared by the Six Rivers, Trinity, and Mendocino National Forests. Two other nearby Class I areas, Redwood National Park west of the Forest and the

Kalmiopsis Wilderness north of the Forest in Oregon, should not be affected since prevailing winds tend to blow from these areas toward the Forest. There are two heavy industrial sites along Humboldt Bay, and both are over 50 air miles from any Class I area.

The Siskiyou, Trinity Alps, and North Fork Wildernesses designated in 1984 by the California Wilderness Act are Class II areas, as is the rest of the Forest. In Class II areas, air quality deterioration normally accompanying moderate, well-controlled growth is considered acceptable. The Forest is currently well within standards established for Class II areas. There are no Federal visibility standards, but state visibility standards are overseen by the State Air Resources Board.

A State Air Resource Board monitoring site is located at Gasquet as a clean background site. There is low potential for problems in the near future because of projected limited growth in population and industry and limited air transport into the Forest.

Factors With a Potential to Affect Air Quality:

Smoke from prescribed burning: A primary source of PM10 is smoke. Smoke can affect visitors' health and recreation experiences and reduce air quality in communities within or adjoining the boundaries of the Forest. The Forest used burning for hazard reduction, site preparation, habitat improvement for wildlife, and other forestry projects on an average of 2,045 acres per year during the period 1983-1993 (Table III-2). Records on the number and tons/acre burned have only been kept since 1989. The period from 1989-1993 shows an overall decrease in estimated PM10 emissions and average tons/acre burned, mainly due to leaving more coarse woody debris on the ground.

Table III-2.
Prescribed Burning Data and Emission Estimates.

| Year | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Acres Burned | 2917 | 874 | 2764 | 2810 | 1439 | 1292 | 3512 | 2245 | 1497 | 1733 | 1417 |
| Number of burns | | | | | | | | 254 | 148 | 125 | 152 |
| Tons Burned | | | | | | | 231864 | | 105564 | | 62791 |
| Avg. tons/acre burned | | | | | | | | 66 | 47 | 50 | 36 |
| PM10 produced (tons)* | | | | | | | | | 2527 | 1150 | 684 |

| Year | 1994 | 1995 | 1996 |
|---|---|---|---|
| Number of burns | 125 | | |
| Tons Burned | 62620 | 66189 | |
| Avg. tons/acre burned | 47 | | |
| PM10 produced (tons)* | 682 | 721 | |

* PM10 estimated from emission factors derived by Ward et al. c(1989).

Smoke management is considered when developing a burn plan and burn prescription. Prescribed fire is used on the Forest normally in the early spring and very late fall when higher moisture conditions make burning safer. This also minimizes effects of smoke on visitors who normally recreate in the summer. Effects on communities can be annoying, but these effects are lessened by the low frequency, short duration, and season of prescribed burning. There have been no instances of prescribed burning affecting transportation safety.

Smoke from wood burning stoves: The Forest sold 2,458 firewood cutting permits in 1993, to be used by individuals for home use. Smoke from wood burning stoves has not been an air quality problem in either air basin and is not expected to become a problem in the future. Populated areas within and adjoining the Forest are very small and quite scattered. Larger population centers are at such a distance that transportation of firewood into other air basins is not economically feasible.

Smoke from wildfire: Wildfire events affect both air quality and transportation safety (through impaired visibility). PM10 emissions from wildfires are typically much higher than those from prescribed burns because of more extensive and longer lasting flaming. Management techniques to reduce the amount of fuels buildup and aggressive wildfire control response can minimize the effects of wildfires on air quality. However, large wildfire events like the 1987 fires can be expected to recur.

Road dust: There are over 2,800 miles of roads through the Forest. Many of these are open to the public. Road dust from dirt surfaced roads create both air quality and safety problems in the summer. Logging creates concentrated, heavy traffic in localized areas. However, contract provisions require timber purchasers to control road dust caused by their operations. Recreation and administrative traffic also create dust. However, this is a low frequency, short duration pollution hazard to Forest users.

### Opportunities

Periodic monitoring of ambient air quality will provide insights into the immediate air quality situation and provide a basis for measuring trends. Air resource management is a rapidly changing and developing technology. New air quality standards are being developed, and new regulations are being written as the knowledge base increases. Close coordination with federal, state, and local officials in research, regulation, and on-the-ground applications, particularly in the area of smoke management, is essential. Alternative fuel management techniques and adjustments of prescribed burning prescriptions may be necessary to maintain air quality attainment levels.

### Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on air quality are discussed further in Chapter 4.

## BIOLOGICAL ENVIRONMENT

## BIOLOGICAL DIVERSITY

### Public Issues

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

Issue 7 How will vegetative diversity be maintained Forest-wide?

Issue 8 How will “old growth” be preserved?

Introduction

Biological diversity, sometimes called biodiversity, is the variety of living things in an area and the ecological processes in which they function as a system. Biological diversity cannot be described in the context of a single resource; rather, it is the interaction of environmental components, modified by ecological processes, under highly variable conditions through space and time.

These interactions and processes result in frequent changes to the environment. Most of the changes are not visible unless viewed over many decades. In some cases, where catastrophic events such as fire or floods have occurred, changes are more evident. These changes continually affect the environmental components and ecological processes that shape the environment.

Ecological systems are not static. The structure and function of ecosystems are largely regulated along energy, moisture, nutrient, and disturbance gradients. These gradients are affected by climate, physiography, soils, hydrology, flora, and fauna. Ecosystems develop slowly over time through a variety of interactive processes. In general, ecosystem processes occurring at smaller scales operate at higher frequencies, while processes occurring over larger spatial scales operate at lower frequencies. The most influential factors at broad scales are typically abiotic, while at finer scales both biotic and abiotic factors have important influences.

Understanding and assessing biological diversity is important in forest planning for several reasons. A forest that is healthy, resilient andproductive over the long-term is one that will support a wide variety of living organisms and communities. The National Forest Management Act of 1976 (NFMA) requires the management of National Forests to “provide for the diversity of plant and animal species based on the suitability and capability of the specific land area in order to meet overall multiple use objectives....”

Elements of biological diversity are important at different scales, such as the section (groups of similar river basins; the Forest is within both the Klamath Mountains and North Coast Mountains Sections), landscape (groups of similar watersheds), and stand levels. Ecosystem diversity must be analyzed at varying scales. Heterogeneity at smaller scales may be organized into predictable patterns at higher scales. Repetitive patterns that are hidden, but contribute to larger patterns or structure, can be examined within and among larger landscape scales. Genetic diversity, species composition, and plant and animal communities are important at all scales.

Managing for ecosystem diversity involves maintaining micro-habitats for some species and macro-habitats for other species. Research indicates that greater habitat diversity allows for greater species diversity.

The basis of biodiversity is genetic diversity. The entire spectrum of taxonomic diversity within and among species can be viewed as a continuum of genetic diversity. The genetic diversity of a species assures the presence of a wide array of traits, enabling it to adapt to changes in its environment. Maintaining genetic diversity within a species generally requires a population size large enough for

plants or animals to breed within and among populations. Where habitat availability is a limiting factor, the maintenance or improvement of habitat is intended to assure that no species require listing under the Endangered Species Act.

All ecosystems have fundamental elements comprised of components, structure, and processes. Components are the kinds and amounts of elements such as plants, animals, soil, and water. Structure refers how the elements a distributed both vertically and horizontally. Processes refer to the flow or cycling of energy, materials, and nutrients through space and time. To reflect these three elements, this section has been divided into 3 parts: 1) component elements of biological diversity; 2) structural elements of biological diversity; and 3) process elements of biological diversity.

Current Situation

Preface:

Most landscapes within the Forest contain complex vegetation patterns and an unusually rich and varied flora. The geologic age and variety of rock types, the resulting topography and soils, and localized climates are all factors that contribute to this diversity. Disturbance factors such as fire, floods, landslides, windthrow, and insect epidemics shape the patterns on a more short-term scale.

Most of the Forest is covered by extensive conifer, conifer-hardwood, and hardwood forest types. These forest types include the tanoak, Douglas-fir, white fir, red fir, white oak, and black oak series. There are some stands of redwood in the northwest portion of the Forest, and some grassland and chaparral types towards the southern end of the Forest. The mixture of vegetation types varies with elevation, bedrock material, slope position, and available soil moisture.

Human influences have also affected the ecology of the Forest. Over the previous century, management activities such as prescribed fire, fire suppression, logging, and road construction have had important influences on vegetation at the stand and landscape levels. Burning by Native Americans prior to European settlement also influenced the composition and patterns of vegetation.

In order to examine biological diversity across a variety of scales requires a hierarchical scheme based on well defined ecological units. The Forest Service developed the National Hierarchy of Ecological Units (USDA, 1993) to serve this purpose. This hierarchy is used to classify land based on combinations of similar climate, physiography, and vegetation. Classifications such as the National Hierarchy allow for the organization of knowledge about ecological systems and provide knowledge about how the components of the system interact (Yarie, 1983). This is particularly important now, since the Forest Service has committed itself to managing on an ecosystem basis (USDA, 1992), with emphasis on maintenance of biological diversity.

The National Hierarchy is divided into a nested set of scales that allow for the analysis of various ecological elements at different (element dependent) scales. The scale considered most appropriate for forest planning is the section or sub-section. The Six Rivers National Forest is included within the Klamath Mountains and North Coast Mountains Sections1/. The Smith River National Recreation Area (NRA) and Orleans and Lower Trinity Ranger Districts of the Forest are within the Klamath Mountains Section, while the Mad River Ranger District is within the North Coast Mountains Section. It is important to know which Section of the National Hierarchy you are in to

understand ecological process and function. For instance, the climate in the North Coast Mountains Section is drier than that found in the adjacent Klamath Mountains Section (Albert, 1979; Parsons and Knox, 1984; USDA, 1993). The closed canopy conifer stands in the Klamath Mountains Section give way to a mosaic of conifer forests and their seral stages, intermixed with oak woodlands and grasslands, in the North Coast Mountains Section. This mixing of unlike vegetation types is the result of the change in climate and an increased level of stand replacing fires and physiographic factors such as soil depth, soil texture, and coarse fragment content, along with geomorphic processes such as mass soil movement. An example of increased natural disturbance in the North Coast Mountains Section is found in the frequency of old-growth forest. The background level of old-growth forest in the North Coast Mountains Section was approximately 10 percent prior to intensive forest management, compared to 50 percent in the adjacent Klamath Mountains Section.

Component Elements:

Increased controversy over use and allocation of resources and concerns for the loss of biological diversity and the health of forest ecosystems has caused the Forest Service to review its approach to management of the national forests and grasslands. This change in strategy, labeled ecosystem management, provides a new approach to management based on ecological principles. The goal of ecosystem management is to conduct management and research with emphasis on maintenance of ecosystem processes and functions (USDA, 1992). To begin understanding ecosystem processes and functions requires a vegetation classification system based on potential natural vegetation units in combination with soils, physiography, and response to disturbance. The potential natural vegetation (PNV) units then are used to analyze ecosystems (coarse filter analysis). It is thought that maintaining representative examples of various PNV types will protect viable populations of most species (85-90 percent) and maintain biological diversity (Noss, 1987; Hunter, 1991).

1/ The boundaries of National Hierarchy “sections” differ from boundaries of Forest Service “provinces,” a term used throughout this EIS, the Forest Plan, and the FSEIS ROD. Provinces, also called physiographic provinces, were established using a variety of factors, including state boundaries; sections were delineated based on physiography and macro-features of vegetation. Boundary differences occur outside the Six Rivers National Forest, however, so that Forest lands within the Klamath Mountains Section are also within the California Klamath Mountains Province and Forest lands within the North Coast Mountains Section are also within the California Coast Range Province.

The Forest Service in the Pacific Southwest Region has begun a long-term project to develop an ecological classification system for the 20 million acres it manages in California. The Region is divided into 8 zones that closely follow the geographic regions of Hickman (1993). The initial classification effort focused on developing classifications for forest, chaparral, and riparian vegetation types (Allen, 1987). These classifications follow those developed by federal agencies throughout the United States. They provide a common language for better communications between specialists, an ecological data base to help understand plant-environment interactions, and a tool for land and resource management (Wenger, 1984). The California portion of this classification effort will identify and describe vegetation using a hierarchical approach. First, vegetation series are described, followed by vegetation sub-series, and finally plant associations. The long-term objective is to describe vegetation/soil/physiographic/management units called ecological types. These units

are distinguished from each other by differences in species composition, soils, productivity, physiography, and expected response to management (Allen, 1987).

In the early phases of this project the management implications are not always known, and therefore the classified vegetation units are referred to as plant associations. Management implications are developed as the classification and mapping of plant associations progresses. Many of the management implications for each plant association are developed during seral stage sampling of treated or disturbed stands, or during the mapping phase of the California classification effort called Ecological Unit Inventory (EUI). In EUI, potential natural vegetation is mapped along with vegetation seral stages, soil type, bedrock geology, and geomorphology. From this intensive mapping effort, relationships between these primary layers are identified and management implications derived. Thus we can see that ecological classification is not only a tool to be used in ecosystem management, but, when combined with mapping, is a way of evaluating and tracking changes in biological diversity.

The vegetation classification and the mapping efforts are used below to describe the vegetation of the Six Rivers National Forest.

Setting The Stage: The Six Rivers National Forest is located in the northwest corner of California. It is bounded on the north by the Oregon border, on the south by the Mendocino County line, on the east by the Klamath and Shasta-Trinity National Forests, and on the west by the Six Rivers National Forest boundary.

Climate: Northwest California has the most predictable and wettest climate in California (Hickman, 1993). It is characterized by warm, dry summers and cool, wet winters (Shumway, 1981). These conditions are moderated by coastal fog and its cooling influence in the coastal portions of the Forest. Mean annual air temperature is approximately 45oF (7oC) (Parsons and Knox, 1984). Summer temperatures seldom exceed 90oF (32oC) except in the inland portions of the Forest, while winter temperatures are cool ranging from 10oF to 45oF (-12oC to 7oC). Mean annual precipitation ranges from 50 to 120 inches (125-305 mm) per year (Albert, 1979).

Environment: Within the Mediterranean climate of the Forest the effects of the environment on vegetation are modified by three primary environmental gradients. They are elevation, available soil moisture, and the chemical composition of the soil forming parent rock.

Elevation: Within the Forest, the dominant topographic features include the Coast Ranges and Klamath Mountains. Elevation ranges from 100-6500 ft. (30-1980 m). Slopes are generally steep, ranging from 0 to 95 percent. Elevation affects vegetation through its influence on soil temperature and the length of the growing season. Elevation effects are modified by slope and aspect. High elevation sites such as those in the red fir series on north slopes, for instance, may have snow packs that last into July. The effect of this is a growing season as short as four months. The growing season on south facing slopes, because of the increased solar radiation received, could be as long as six months (Jimerson, 1989). In contrast, low elevation tanoak sites are usually devoid of snow and may have potential growing seasons as long as nine months. Here the limiting factor in plant growth is usually available soil moisture.

Available Soil Moisture: The Forest is situated along two moisture gradients. The first runs from west to east; the second is a northwest to southeast axis in relation to the Pacific Ocean. The effect of these axes is a moist to dry moisture gradient. The northwest corner where the Smith River NRA is located is cool and moist, while the southeast corner of the Forest where the Mad River Ranger District is located is hotter and drier. The plant species found in these two extremes reflect this moisture gradient. For instance coast redwood (Sequoia sempervirens Endl.), a wet area plant, is found on the NRA, while Ponderosa pine (Pinus ponderosa Dougl.), a dry area plant, is found on the Mad River Ranger District.

Available soil moisture is affected by soil depth, micro-position, micro-relief, coarse fragment content, and texture. Slope position affects available soil moisture by its relationship to soil depth. Ridgetop positions tend to have shallower soils than lower one-third slopes, and hence have lower soil moisture storage capacity. Slope shape also influences soil moisture by its effect on water movement. For instance, concave slopes tend to concentrate water, while convex slopes contribute to water run-off and hence lower available soil water. Slope shapes also contribute to soil depth by the same means. Coarse fragment content influences soil water storage capacity by its replacement of space capable of storing water, with rocks. In addition, soil texture determines the potential soil water storage capacity of a given soil. Coarse textured soils such as those derived from granitic or sandstone parent material have much lower soil moisture storage capabilities than those derived from fine textured rocks such as phyllite or schist.

Geology: The major geologic bedrock of the Forest within the Klamath Mountains Section includes Mesozoic ultrabasic intrusive, Jurassic-Triassic metavolcanic, upper Jurassic marine sedimentary formations, Mesozoic granitics, pre-Cretaceous metamorphic, and small amounts of Franciscan formation (Fraticelli et al., 1987). The geology of the North Coast Mountains Section is dominated by Franciscan formations, pre-Cretaceous metasedimentary, and small outcrops of Mesozoic ultrabasic intrusive rocks (Wagner and Saucedo, 1987).

The soil forming parent rock has dramatic effects on the type of vegetation that can compete on a given site. Parent rock influences soil texture, decomposition rate (soil formation), stability, and nutrient content. Soil texture as explained above affects moisture storage capability. Rock decomposition rates influence the rate of soil formation and the stability of soils formed. Soils formed from granitic parent material tend to decompose at a faster rate than those derived from finer textured rocks such as schist. The rate of decomposition and the coarse texture of granite leads to low stability and unraveling. The chemical composition of the parent rock is clearly demonstrated in the difference between soils derived from serpentine rocks and those derived from schist. The calcium/magnesium ratio is shifted towards magnesium in soils derived from serpentine, and levels of other toxic minerals such as iron, zinc, lead, nickel, and chromium are increased. Calcium levels are much higher in soils derived from schist, and toxic minerals are usually found in low amounts.

Disturbance: Fire is the primary natural disturbance agent within the Forest. The effects of fire are related to intensity and duration. For instance, low intensity fires may result in the removal of the fine forest fuels and some large logs with low live tree mortality, while high intensity fires often consume snags and down logs and result in stand replacing events that kill most or all of the trees.

Fire frequency is related to slope position, vegetation series, and aspect (Atzet and Wheeler, 1982). Mean stand age of natural stands varies significantly by slope position within the Forest, and

vegetation series tends to have a significant relationship to slope position. For example, lower one-third slopes on the Smith River NRA have a mean stand age of 302 years, and are dominated by Port-Orford-cedar and tanoak. These two series have mean stand ages of 373 and 263 years, respectively. Ridgetops and upper one-third slopes have mean stand ages of 199 and 239 years, respectively, and are dominated by Jeffrey pine, lodgepole pine, and western white pine. The mean stand ages of these series are 245, 145, and 123 years, respectively. The significantly older Jeffrey pine stands are a result of a lower stand-replacing fire interval related to the dominant plant association in this type, the Jeffrey pine/Idaho fescue type. Here, ladder fuels are low due to stand structure characterized by open stands with low canopy closure, very low shrub cover, and a dense grass layer. It is this dense grass layer that contributes to frequent low intensity fires, which lead to very infrequent stand-replacing fires.

This relationship between stand age, slope position, and vegetation series, indicates that stand-replacing fires occur with higher frequency in upslope positions and are related to vegetation series.

Fire regimes in the Klamath Mountains Section are characterized by frequent low intensity surface fire. Individual fires include high intensity events which produce patches of overstory mortality. A preliminary analysis of data from a study conducted by Alan Taylor of Pennsylvania State University and Carl Skinner of PSW in Redding suggest fire return intervals of 7-35 years for various sites over a 300-400 year period, with most sites characterized by a return interval of 10-17 years (Taylor and Skinner, in preparation). These estimates correlate well with those reported by Agee (1991) and Wills (1991).

Past human caused disturbances such as aboriginal burning, cattle and sheep grazing (and associated burning to increase forage), and mining (along with its associated logging for mine timbers and building materials) have also had an impact on landscapes on the Forest. Recent management activities, such as logging and road construction, have had a significant effect on the seral stage distribution, patch sizes, and amount of edge (Jimerson and Hoover, 1992; Jimerson, 1994).

Vegetation Classification: A variety of vegetation/geographic classification schemes have been developed for California. The purpose of these schemes is to predict where plant taxa can be expected to grow (Hickman, 1993). The vegetation series described for the Six Rivers National Forest follow the Forest Service vegetation classification scheme for the Pacific Southwest Region (Allan, 1987). They include tanoak, white fir, Douglas-fir, lodgepole pine, red fir, white oak, Jeffrey pine, grasslands, Port-Orford-cedar, western white pine, black oak, redwood, and mountain hemlock. Appendix H contains complete descriptions of each series. Table III-3 shows the estimated number of acres and percent of the Forest in each vegetation series.

Table III-3.
Forest Vegetation Series

| Vegetation Series | Approximate Acres | Percent of Forest |
|---|---|---|
| Tanoak | 330,000 | 35 |
| White fir | 90,000 | 9 |
| Douglas-fir | 350,000 | 37 |

| | | |
|---|---|---|
| Lodgepole pine | 50,000 | 5 |
| Red fir | 19,000 | 2 |
| White oak | 50,000 | 5 |
| Jeffrey pine | 17,000 | 2 |
| Grasslands | 19,000 | 2 |
| Knobcone pine | 2,000 | < 1 |
| Port-Orford-cedar | 10,000 | 1 |
| Western white pine | 5,000 | < 1 |
| Black oak | 3,500 | < 1 |
| Chaparral | 2,500 | < 1 |
| Redwood | 1,000 | < 1 |
| Other types | 9,000 | < 1 |
| Total | 958,000 | 100 |

Definitions: The following definitions are used throughout the Pacific Southwest Region of the Forest Service to standardize the approach to its hierarchical vegetation classification. At the top of the vegetation hierarchy is the series. Series are identified by the presence of the dominant species throughout the structural layers present in late seral stage stands. Series are followed in the hierarchy by the sub-series. Here the series name is modified by the addition of a second species that has indicator value across multiple plant associations. At the bottom of the classification hierarchy the finest vegetation units described are plant associations. They are the potential natural community with uniform appearance and definite floristic composition.

Nomenclature: In northwestern California, species nomenclature follows Munz and Keck (1968) and common names used follow Abrams (1968), Munz and Keck (1968), and Atzet and Wheeler (1984).

Classification Elements: The vegetation of the Forest can be divided into three major categories: forest series, oak woodlands, and grasslands. The forest series include the Douglas-fir, tanoak, white fir, red fir, Port-Orford-cedar, mountain hemlock, lodgepole pine, Jeffrey pine, redwood, and western white pine series. The oak woodlands category includes the black oak and white oak series. The grasslands of the third category are frequently dominated by non-native annual grasses due to past management practices such as heavy grazing.

The preliminary results of the vegetation classification identified 163 plant associations and 52 sub-series within 13 vegetation series. The Douglas-fir series had the highest number of sub-series, 11, followed by the white fir series with 8, and the tanoak series with 7. The white fir series had the highest number of plant associations, 42, with the tanoak series containing 38, and the Douglas-fir series 26.

The number of sub-series and plant associations, however, is not a good reflection of community diversity within a series. For example, the Douglas-fir series has the greatest extent (350,000 acres) on the Forest (Table III-3) and contains 11 sub-series and 25 plant associations. In contrast, the Port-Orford-cedar series includes only 10,000 acres, yet it contained 6 sub-series and 12 plant associations. In order to compare diversity between series, a way of standardizing series was

required. This standardization, here termed a community diversity index (CDI), is based on plant association diversity in relation to the extent of the area covered by the series; the unit of measurement for the extent is 10,000 acres. The calculation takes the form:

CDI = number of plant associations in series extent of series (10,000 acres)

Table III-4 lists the CDIs for 12 vegetation series. Using the CDI, we are able to see an entirely different picture of community diversity. The Port-Orford-cedar series has the highest CDI, 12.0, due to its limited extent and high number of plant associations. The series with the greatest extent, Douglas-fir, had the lowest CDI, 0.7, due to its large number of acres. The tanoak series, second in extent, also had a low CDI of 1.2. The red fir and Jeffrey pine series had relatively high CDIs of 9.0 and 4.1, respectively, due to their limited extents and high numbers of plant associations.

Table III-4.
Community Diversity Index (CDI).

| Vegetation Series | Plant Associations | Acres | CDI |
|---|---|---|---|
| Tanoak | 39 | 330,000 | 1.2 |
| White fir | 41 | 90,000 | 4.6 |
| Douglas-fir | 25 | 350,000 | 0.7 |
| Lodgepole pine | 3 | 50,000 | 0.6 |
| Red fir | 17 | 19,000 | 9.0 |
| White oak | 5 | 50,000 | 1.0 |
| Jeffrey pine | 8 | 17,000 | 4.7 |
| Grasslands | 5 | 19,000 | 2.6 |
| Port-Orford-cedar | 12 | 10,000 | 12.0 |
| Western white pine | 2 | 5,000 | 4.0 |
| Black oak | 2 | 3,500 | 5.7 |
| Redwood | 1 | 1,000 | 10.0 |

Sensitive Plants: Northwestern California, because of its wide environment gradients and past history, contains a high number of sensitive and endemic plant species. The majority of sensitive plants are found on soils derived from serpentine or ultramafic parent rock. The Douglas-fir and Jeffrey pine series both contain 14 sensitive plants. They were followed in sensitive plant occurrences by the white fir series with 7, the lodgepole pine series with 4, and the western white pine series with 3. All other series had 1 or no sensitive plant occurrences.

Vegetation/Environment Relationship: The redwood (Sequoia sempervirens Endl.) series was the coolest and wettest and the lowest in elevation of all series identified on the Forest (see Appendix H, Figures H-1 and H-2). It is located nearest to the Pacific Ocean in areas with coastal fog. Hence, it has the coolest mean summer air temperatures and the highest available moisture. It is followed in available moisture by the Port-Orford-cedar series, which is generally located adjacent to streams or

in areas with sub-surface water flow. The tanoak series was ranked as mesic in its moisture requirements (see Appendix H, Figure H-1) and had the second lowest mean elevation to redwood (see Appendix H, Figure H-2). In areas where available moisture is lacking, the tanoak series is restricted to lower one-third slope positions (see Appendix H, Table H-1) where available moisture is highest. The Douglas-fir series replaces the tanoak series on warmer/drier sites where available moisture becomes limited and elevation rises. The white fir series replaces Douglas-fir as we rise in elevation and move into the cooler, frigid soil temperature regime (Jimerson, 1989). The red fir (Abies magnifica A.Murr. var. shastensis Lemmon) series was found on the highest elevation sites with the coldest mean winter air temperatures (see Appendix H, Figure H-1). Moisture conditions here vary by plant association according to soil depth, parent material, slope shape, and slope position. The mountain hemlock series is intermixed with the red fir series in shaded draws on the coldest sites. This series is of limited extent within the Forest.

Shifting from the cold, high elevation sites to the hot, mid-elevation slopes we find the grassland series (see Appendix H, Figure H-1). It occurs on the warmest sites with the lowest available moisture. The grassland series tends to be found on hot southwest facing slopes with shallow soils high in rock fragments. The white oak (Quercus garryana Dougl.) and black oak (Quercus kelloggii Newb.) series are usually found in close proximity to the grassland series, forming a mosaic. They are usually found on sites with deeper soils and higher water holding capacity, particularly in the case of black oak.

The western white pine (Pinus monticola Dougl.), knobcone pine (Pinus attenuata Lemmon), lodgepole pine (Pinus contorta Dougl.), and Jeffrey pine series are found almost entirely on dry, harsh sites, with soils derived from serpentine parent material (see Appendix H, Table H-4). The plant communities found here are very different from those found on sites derived from other types of parent rock, in that they are generally open stands with stunted trees.

Species Diversity-Vegetation: Different groups of plants and animals are commonly found in association with specific vegetative types and seral stages. When a stand is in the early seral stages, populations of pioneer species that need open habitats are present. These are replaced by different species as the stand matures. Often, structural remnants of previous seral stages remain on the site, providing micro-habitats used by plants and animals. These may include snags, down logs, and so forth.

Species diversity is generally high during early seral stages of forest development until young trees form a closed canopy. When this occurs, many understory plant species are shaded out; species diversity then decreases in intermediate seral stages. As stands mature and gaps form, a more complex structure develops. This results in more niches becoming available for plant and animal species. Generally, species richness increases again during the later seral stages.

Species Diversity-Animal: The abundance and distribution of vegetation types, vegetation attributes, micro-habitat climatic conditions and water sources are as important to wildlife and fish as the abundance and distribution of the animals. Typically, animals depend on specific vegetation structural attributes, distribution and spacing, and water. Maintaining vegetation diversity throughout the Forest will help maintain diverse wildlife and fish populations.

Species Diversity-Genetic: Maintaining long-term viability of all species, and having healthy and vigorous populations, depends partly on having adequate genetic variability within and among populations. The size of populations and their relative distribution will affect their ability to respond to environmental or catastrophic change.

Structural Elements:

Stand Structure: Forest stands contain a variety of structural elements. These elements include the size and density of vegetation, the number, size, and type of snags, hardwood components; and coarse woody debris on the forest floor. These features vary greatly, depending on the frequency and intensity of fire and other disturbances, along with the vegetation that occupied the site before the disturbance, and other factors.

Hardwood Component: Hardwoods are a major vegetation component in many of the Forest vegetation types; there are also pure hardwood stands on the Forest. The presence of hardwoods within an area varies from little or no presence in the red fir and white fir series found at higher elevations, to greater than 50 percent of the basal area in selected plant associations within the tanoak series.

Landscape Vegetation Patterns: Horizontal forest structure, or the vegetative patterns that comprise a landscape, influence the overall stability and diversity of habitats occupied by plant and animal species.

Vegetation Patterns-Shapes and Sizes: The size, shape, adjacent vegetation condition and distribution of vegetation patches determine their function in the overall vegetation mosaic. Patch size can be particularly important to the functioning of forested vegetation as habitat for some wildlife species. This is especially true for those species requiring special or homogeneous habitat.

Patch size is quite variable across our Forest landscapes. This is due to the complexity of geology, soils, topographic features, and disturbance regimes (human and natural) on the Forest. Patch shape tends to be more linear than broad, as many forest stands follow patterns along drainages, ridges, or geologic features.

Fire and other natural disturbances have had a major effect on landscape patterns in managed and unmanaged areas. Over the last 40 years, management activities have suppressed wildfires, resulting in heavier fuel loadings than would have occurred under natural conditions.

Forest Fragmentation: Fragmentation, defined as the disruption of continuity (Lord and Norton, 1990), is a result of both natural and human factors. The mixing of unlike vegetation types and the increased level of natural disturbance due to variable climate within the Forest contribute to natural fragmentation. Human disturbance also contributes to fragmentation and is primarily related to past timber harvests and livestock grazing. Disturbances caused by Native American land management practices arealso affected local landscapes, but the effects of their management are thought to be much less extensive than the effects of timber harvesting and livestock grazing.

Habitat fragmentation affects the suitability of dense old growth forests by changing microclimate by altering temperature and moisture regimes; changing the availability of cover;

bringing species such as nest parasites, competitors, and predators together; and increasing contact with and exploitation by humans (Morrison et al., 1992). Fragmentation of old growth habitats affects species richness of communities, population trends of some species, and overall biological diversity of the ecosystem (Morrison et al., 1992) and threatens the maintenance of viable wildlife populations (Lehmkuhl and Ruggiero, 1991).

Microclimate patterns (air temperature, relative humidity, soil temperature, and wind speed) and associated biological features (for example, species composition) differ between cut areas, cutting boundaries, and interior forests (Spies et al. 1990). Microclimate effects from edge may extend "two tree lengths" or approximately 400 feet into the forest interior (Harris, 1984; Franklin and Forman, 1987; Spies et al., 1990). Thus, fragmentation of old growth forests is a concern for a number of plant and wildlife species associated with forest interior conditions which are adversely affected by the proximity of early seral stage vegetation and associated edges.

Connectivity: Dispersal and movement between habitat patches is critical to long-term viability of plant and animal populations. While knowledge of dispersal patterns is incomplete, landscape patterns play an important role in either facilitating or inhibiting dispersal (Noss and Harris, 1986). Forest Service regulations (36 CFR 219.19), in response to NFMA, require the maintenance of viable populations that are well distributed throughout their current geographic range. A variety of strategies employed concurrently may accomplish this: providing large contiguous stands of mature and old growth, closed canopy forest conditions (for example, ecological corridors) is one facet of this strategy; meeting the 50-11-40 rule of the ISC report is another; riparian corridors still another.

Landscape Structure: Landscape composition is determined by the combination of environment and climate. One of the larger scale units of the National Hierarchy of Ecological Units, the Section, divides the United States into units of similar climate, physiography, and vegetation. The Forest is within two of these Sections. The North Coast Mountains Section is characterized by a dry environment with coarse textured soils derived from sedimentary rocks (Jimerson et al., 1994). The Klamath Mountains Section is characterized by a wet environment dominated by fine textured soils derived from metamorphic parent rocks. These two sections differ considerably in their vegetation and natural fragmentation resulting from the unlike vegetation types, drier environment, and frequency of natural disturbance.

The North Coast Mountains Section has a very different landscape composition and configuration from that of the adjacent Klamath Mountains Section. The North Coast Mountains Section is dominated by the Douglas-fir series as the primary vegetation type; the Klamath Mountains Section is dominated by the tanoak series. Tanoak is thought to have higher moisture requirements than Douglas-fir (Atzet and Wheeler, 1984). This is exemplified in the North Coast Mountains Section where the tanoak series was found in lower one-third, moist, north facing slopes, while the Douglas-fir series was found in lower one-third, dry slopes with south facing aspects. While tanoak dominates in the Klamath Mountains Section, it is a minor component of the North Coast Mountains Section. Here it is often restricted to very narrow bands in streamside positions. This points to the available moisture differences between these two adjacent areas and its effect on the success of certain vegetation types.

The vegetation of the North Coast Mountains Section forms a mosaic of unlike vegetation types due to the drier site conditions and the increased frequency of fire. These vegetation types contribute to a moderate level of natural fragmentation due to the differing structural characteristics of the vegetation. For example, conifer forests are located adjacent to oak woodlands, which are in turn located adjacent to grasslands. Seral stages within the conifer forest and oak woodlands further contribute to fragmentation. In the Klamath Mountains Section most of the area is carpeted by conifer forests where fragmentation is mainly related to changes in coniferous seral stages.

Human intervention in natural processes, such as fire, also influences landscape composition. In some cases, fire prevention has altered natural fire regimes and allowed Douglas-fir to successfully regenerate on sites that would normally be dominated by white oak. Clearcut timber harvest accompanied by broadcast burning has increased the frequency of Ceanothus dominance in plantations.

The variation in climate affects the boundaries of vegetation series by its modification of environment. For example, ecology plot sampling along Pilot Ridge identified white fir stands which display thick, dark, surfaces (mollic epipedons) that are high in organic material (Mitchel, 1981). They result from the decomposition of underground organic material, indicating past site dominance by grass. This occurs in northern California when sites are dominated by grass for long periods of time. This indicates that during past periods of drier climate the boundaries of the white fir and grassland series and their extents were very different than they are now. Pollen analysis of soil pits in the same area confirms this observation (Hildebrandt and Hayes, 1983).

In order to understand landscape structure, it must be identified and described in ways that identify the interactions between landscape patterns and ecological processes (Turner, 1989). This section describes and quantifies landscape composition (the type and amount of vegetation elements) and their relationship to environment and landscape configuration. Landscape configuration (fragmentation) is described with a variety of indices (measures) on the Forest. Landscape indices are used to quantify landscape patterns so that relationships between landscape structure and landscape functions and processes can be established (O'Neil et al., 1988).

This landscape analysis utilizes the information collected by the Ecology program in the classification of vegetation types on the Forest, as well as the vegetation mapping effort. The basis for the landscape analysis is the division of the Forest into three zones corresponding to sub-sections of the National Hierarchy of Ecological Units (1993). The three zones identified by the LMP core team are the north, central, and south zones. The north and central zones lie within the Klamath Mountains Section of the National Hierarchy. The north zone includes the Smith River NRA and the west side of the Orleans District. The central zone includes the east side of the Orleans District and the Lower Trinity District. The boundary between the north and central zones is the Klamath river. The south zone is entirely within the North Coast Mountains Section and covers the Mad River District. A map of the zones is shown in Figure III-8. The description of the three zones in the context of the National Hierarchy, of which they are sub-sets, allows for comparison to adjacent areas with differing levels of disturbance and landscape fragmentation. The objective of the analysis is to better understand the relationship of various landscape components to environment, landscape processes, and functions. This will allow for management of the Forest at the landscape and ecosystem levels.

Landscape Composition: Landscape composition is described using the information gathered during the ecology plot sampling and mapping efforts, Landscape composition refers to the number of landscape element types and the distribution among these types (Li, 1989). Landscape composition is described below by vegetation category (conifer forest, oak woodland, grassland, hardwood forest), vegetation series (examples: white fir, black oak), seral stage (shrub/forb through old-growth), tree size class (examples: 0-5.9" and 21-35.9"), and canopy closure (examples: 40-69 percent, more than 70 percent). Appendix H provides descriptions of how vegetation series were arranged on the landscape and series descriptions.

Choice of Scale: The choice of scale, including both grain and extent, affects the outcome of the analysis. For instance, the grain of vegetation could be analyzed at the gross scale, such as conifer forest or oak woodlands, or at the fine scale, such as plant associations. These two scales will yield very different results. The extent of the analysis area could also determine the results of the analysis. For example, if you were studying natural disturbance within the white fir series, a large scale would be required to off-set the effects of individual disturbance events (such as a single fire), while an analysis of meadow dynamics would be analyzed at a small scale. The choice of scale, then, is dependent on the question being asked. Since many of the questions related to management of vegetation deal with the amount and configuration of old-growth forests, the intermediate grain of the vegetation series (Douglas-fir, white fir, etc.) was selected for analysis. The analysis area selected, the three forest zones, is extensive enough to address the question of old-growth forest variability, particularly if it is analyzed at the vegetation series level.

Landscape Composition Analysis: Landscape composition is described below in terms of vegetation elements and their characteristics. The elements include vegetation types and seral stages, while the characteristics include stand age distribution, overstory size class, and canopy closure.

The vegetation of the Forest falls along an elevation and moisture gradient and is composed of four general categories: conifer forests, oak woodlands, grasslands, and hardwood forests. The conifer forest category includes 10 major vegetation series: tanoak, white fir, Douglas-fir, lodgepole pine, red fir, Jeffrey pine, knobcone pine, Port-Orford-cedar, western white pine, and redwoods (Table III-3). This category comprises 92 percent of the Forest and is dominant in all 3 forest zones. The tanoak series is included in the conifer category because of its dominance by Douglas-fir in the overstory. The oak woodlands category includes two series: white oak and black oak. It contributes 6 percent of the vegetation on the Forest and is found most often in the south zone. The grasslands category accounts for 2 percent of the Forest vegetation and is found primarily in the south zone. The hardwood forests category is of limited extent and includes the alder and canyon live oak series. It contributes less than 1 percent of the vegetation on the Forest. When hardwood forests, grasslands, oak woodlands, and conifer forests are combined in a given area, as they are in the south zone, they contribute to a mosaic of vegetation types and stand structures.

Seral Stages: The vegetation attributes within stands are constantly changing. Similar attributes and conditions are often grouped into seral stages, which are transitory or developmental stages of a plant community in an ecological progression. The grouping of vegetation into seral stages helps provide a predictable pattern to the environment.

The relative abundance of various seral stages contributes to the diversity of the forest. Seral stages vary in horizontal and vertical structure, providing a diversity of habitats for plant and animal species.

Climatic changes and physical events, such as fire or wind, often influence stand attributes and seral stage progression. In some areas, fire has totally replaced a late-seral stage forested area with an early shrub/forb dominated seral stage. In other areas, fire has left certain stand attributes that allow the stand to maintain ecological processes typically found in a mid-seral stage.

The conifer seral stages on the Forest are described as follows.

SH (shrub/forb harvested): Generally open stands that have resulted from timber harvest, dominated by shrubs, with the top layer of conifers smaller than 6" dbh. Structural diversity, particularly vertical diversity, is very low here, while species diversity can be the highest of all seral stages, but is made up of species that are considered generalists (those that are found in all seral stages). This stage is often limited to one structural layer.

SN (shrub/forb natural): Generally dense stands that have resulted from high intensity disturbance such as wildfire, mass soil movement, or flood, dominated by shrubs with the top layer of conifers smaller than 6" dbh. Structure follows that of the shrub/forb harvest seral stage.

PH (pole harvested): Generally dense, single layer stands (including thinned or released stands) that have resulted from timber harvest, dominated by trees, with the top layer of conifers between 6" and 11" dbh. Shrub layer and herb layer are lacking or non-existent. This seral stage can have the lowest species diversity.

PN (pole natural): Generally dense, single layer stands that have resulted from high intensity disturbance such as wildfire, mass soil movement, or flood, dominated by trees, with the top layer of conifers between” 6 and 11" dbh. Shrub layer and herb layer are lacking or non-existent.

EM (early mature): Generally dense, closed canopy, single layer stands (the tanoak series has a minimum of two layers due to the hardwood component), dominated by trees with the top layer of conifers between 11" and 18" dbh. Shrub layer and herb layer lacking or non-existent. Snag density is low and made up of trees smaller than 18" dbh. Vertical and horizontal diversity lacking, species diversity second lowest of all seral stages.

MM (mid mature): Generally dense, closed canopy stands, with one or two layers (the tanoak series has a minimum of two layers due to the hardwood component), dominated by trees with the top layer of conifers between 18" and 30" dbh. Shrub layer and herb layer of low cover. Culmination of mean annual increment occurs here, and therefore the first pulse of large snags (larger than 20" dbh) appears. Vertical and horizontal diversity low.

LM (late mature): Generally dense, closed canopy stands, with two or more layers present (the tanoak series has a minimum of two layers due to the hardwood component), dominated by trees with the top layer of conifers 30" dbh or larger. Shrub layer and herb layer begin to increase in cover. Snag density increasing, with snags larger than 20" dbh as a standard component. Vertical and horizontal structure diversity begin to appear; species diversity is increasing.

OG (old-growth): Generally open to dense, with multiple layers, dominated by trees of various size classes, the top layer usually larger than 30" dbh. Shrub layer and herb layer apparent, vertical and horizontal diversity high, snag and log density often high and composed of snags and logs larger than 20" dbh. Species diversity here second only to shrub/forb seral stage, with many species restricted to this stage. See old-growth definitions for Region 5 for specific definitions by vegetation type.

Ancient, or old-growth, forests described above are unique ecosystems providing habitat for a variety of endemic plant and animal communities (Hunter, 1989), and they are a primary part of our biodiversity heritage. In the early part of this century, much of the forested lands in the Pacific Northwest were covered by old-growth Forests. Many of these forests have since been logged or burned, with the remaining old growth stands occurring primarily on public lands (Spies and Franklin, 1988). Much of the remaining old growth on the Six Rivers National Forest is found in small patches fragmented by intensive forest management (Jimerson & Hoover, 1991; Jimerson, 1994). Current thinking is to reduce forest fragmentation to avoid degrading the viability of remaining old-growth patches for dependent wildlife and plant species.

The public controversy surrounding management of old-growth has resulted in increased need for specific biologically based and scientifically acceptable definitions of old growth forests. These definitions have been developed for the major forest types of California by the Region 5 Ecology Program (USDA, 1992). They are based upon biological parameters such as stand age, trees per acre of large trees, basal area of large trees, stand structure, vegetation dynamics, snag densities, log densities, log volumes, and layering.

Table III-5 displays estimated percentages of the Forest in the seral stages defined above in each zone within each vegetation category.

Table III-5.
Seral Stage Distribution

| Vegetation Category | Percent of Forest in Each Seral Stage 1/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Forest Zone | SH | SN | PH | PN | EM | MM | LM | OG |
| Conifer Forests | | | | | | | | |
| North Zone | 4 | 3 | 7 | 8 | 26 | 25 | 2 | 25 |
| Central Zone | 8 | 4 | 14 | 2 | 18 | 22 | 15 | 17 |
| South Zone | 6 | 1 | 3 | 1 | 30 | 35 | 15 | 8 |
| Oak Woodlands | | | | | | | | |
| North Zone | - | - | - | - | 94 | 6 | - | - |
| Central Zone | - | - | - | - | 90 | 10 | - | - |
| South Zone | < 1 | 2 | - | 5 | 72 | 19 | 1 | < 1 |
| Grasslands | | | | | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| North Zone | - | 100 | - | - | - | - | - | - | | Central Zone |
| - | 100 | - | - | - | - | - | - | | | |
| South Zone | - | 100 | - | - | - | - | - | - | | |
| Hardwood Forests | | | | | | | | | | |
| North Zone | < 1 | 10 | < 1 | 33 | 56 | - | - | - | | |
| Central Zone | - | 52 | - | 4 | 26 | 18 | - | - | | |
| South Zone | - | 21 | - | 3 | 45 | 30 | 1 | < 1 | | |
| Total | 5 | 5 | 6 | 6 | 30 | 26 | 7 | 16 | | |

1/ Seral stages: SH = shrub harvested, SN = shrub natural, PH = pole harvested, PN = pole natural, EM = early mature, MM = mid mature, LM = late mature, OG = old-growth.

The eight vegetation seral stages identified on the Forest are best represented in the conifer forest category; each seral stage is included in this category. Table III-5 clearly demonstrates the moisture gradient present on the Forest (moving from north to south) and its associated disturbance regime. The old-growth seral stage is best represented in the moist north zone where it accounts for 25 percent of the conifer vegetation. Moving to the central zone, where conditions become drier, old-growth conifer forests account for 17 percent of the Forest. The driest portion of the Forest, the south zone contributes only 8 percent to the old-growth conifer category. The mature seral stages show a reversal of this trend. They increase in frequency when moving from north (53 percent) to south (80 percent). This is indicative of the increased incidence of stand replacing wildfires occurring in the south zone.

The oak woodland category is found primarily in the early mature and mid mature seral stages except in the south zone. Here it is well distributed across most seral stages due to the drier climate and higher frequency of disturbance.

All of the vegetation in the grassland category is contained in the shrub/forb natural seral stage. It includes two percent of the vegetation on the Forest and was found primarily in the south zone.

The hardwood category accounts for less than one percent of the vegetation on the Forest. It is represented in all seral stages, with its highest frequency in the north zone where alders are the dominant vegetation series.

The age class distribution for conifer stands on the Forest is dominated by early mature and mid mature stands between 71 and 160 years stand age. In general, stand age is significantly different by forest zone and slope position. Table III-6 displays the mean age of timber stands on the Forest by slope position within each Forest zone, along with the number of plots sampled, the standard error of the mean, and the standard deviation. Stands within the north zone are older in all slope positions when compared to the central and south zones. Stands within the south zone tend to be younger in each slope position than stands in the north and central zones. This points to an

increased frequency of stand replacing disturbance in the south zone over that found in the north and central zones. The same trend follows for slope position: lower one/third slopes generally contain older stands than upper slope positions as a result of increased disturbance with higher slope position, mainly due to the frequency of lightning fires.

Table III-6.
Mean Stand Age

| Slope Position Forest Zone | Number of Plots | Mean Standard | Stand Age | Error of the Mean | Standard Deviation |
|---|---|---|---|---|---|
| Ridgetop | | | | | |
| North Zone | 85 | 204 | 11 | 101 | |
| Central Zone | 61 | 168 | 12 | 94 | |
| South Zone | 52 | 190 | 13 | 94 | |
| Upper 1/3 | | | | | |
| North Zone | 344 | 249 | 7 | 130 | |
| Central Zone | 175 | 208 | 9 | 119 | |
| South Zone | 118 | 225 | 8 | 87 | |
| Middle 1/3 | | | | | |
| North Zone | 268 | 290 | 8 | 131 | |
| Central Zone | 135 | 285 | 12 | 139 | |
| South Zone | 76 | 242 | 12 | 105 | |
| Lower 1/3 | | | | | |
| North Zone | 338 | 326 | 7 | 129 | |
| Central Zone | 95 | 290 | 16 | 156 | |
| South Zone | 30 | 233 | 16 | 88 | |

The overstory tree size class analysis displays the differences in overstory diameter for conifer forests by forest zone. Table III-7 displays the percent of each conifer overstory size class in each Forest zone. Because of the extent of the conifer category, most size class categories are dominated by them. However, the physiological capabilities of each category become apparent when the frequency of occurrence by size class is examined. For instance, the largest size class, 5 (equal to or larger than 36" dbh), is only represented in the conifer category. Size class 4 (21-35.9") occurs most often in the conifer category. Oak woodlands occur most often in size class 2 (6-10.9"). Hardwood forests occur most often in size class 3 (11-20.9").

Table III-7.

Conifer Overstory Size Class Distribution

Percent of Conifer Overstory in Size Class

| Forest Zone | 1 (0-5.9") | 2 (6-10.9") | 3 (11-20.9") | 4 (21-35.9") | 5 (> 36") |
|---|---|---|---|---|---|
| North Zone | 7 | 17 | 28 | 29 | 19 |
| Central Zone | 18 | 17 | 17 | 29 | 20 |
| South Zone | 6 | 7 | 37 | 39 | 11 |

An examination of overstory size class distribution by Forest zone shows that size classes 4 and 5 occur most often in the north and central zones. The south zone is dominated by trees with overstory diameters in size classes 3 and 4. This follows the seral stage distribution of dominance by the mature seral stage and is the result of the high frequency of stand-replacing wildfires occurring in this zone. The most occurrences of small trees, size classes 1 and 2, are in the central zone, as a result of intensive forest management in the form of clearcut logging.

Canopy closure analysis shows the dense nature of total canopy closure within conifer stands on the Forest. Table III-8 displays the percent of conifer canopy closure class in each Forest zone. The central zone has the highest occurrence (81 percent) of stands with more than 70 percent canopy closure. It also has the highest occurrence (7 percent) of stands with less than 10 percent canopy closure. This is a result of the high frequency of clearcuts within the central zone.

Table III-8.

Conifer Canopy Closure Distribution

| | Percent of Conifer Canopy Closure Class | | | | |
|---|---|---|---|---|---|
| Forest Zone | O (0-9%) | S (10-19%) | P (20-39%) | N (40-69%) | G (> 70%) |
| North Zone | 4 | 1 | 4 | 20 | 71 |
| Central Zone | 7 | 2 | 2 | 8 | 81 |
| South Zone | 4 | 2 | 4 | 19 | 71 |

Landscape configuration: Landscape configuration results from a combination of factors including climate, physiography, natural disturbance, and human disturbance. The primary natural disturbance agent on the Forest is fire, but flood, windthrow, insects, and diseases also play a role. The 1987 California fire siege left its mark on the south zone where approximately 10,000 acres of conifer forest and oak woodlands were converted to the shrub/forb seral stage by stand-replacing wildfires. Human disturbance within the Forest and its effect on vegetation is related to recent timber harvests, firewood gathering, mining, livestock grazing, and Native American use. The effects of these factors is quantified below using a variety of landscape measures.

The forest-wide vegetation mapping information is used to describe landscape configuration. Landscape configuration is the spatial pattern of patches in the landscape mosaic (Li, 1989). Fragmentation is described here by the three forest zones. It includes patch size, patch shape, patch density, and edge density measures described below.

Patch Size: Patch size can be an important factor in limiting use by a variety of wildlife species (Lehmkuhl and Ruggiero, 1991). Patches that fail to meet minimum patch sizes have lower probabilities of supporting breeding populations of birds (Temple, 1988). In addition, patch shapes have similar effects. Those patches with high amounts of edge are suitable for some species and unsuitable for others. The most important factor in patch shape appears to be the amount of interior habitat. It appears to have the highest chance of influencing species survival (Picton, 1979).

Patch size is described here by mean patch size and the frequency of patches by size class. These descriptives allow for an assessment of forest fragmentation and wildlife habitat suitability. In general, mean patch size in natural conifer stands increases with increasing seral stage development. The old growth conifer seral stage has the only significant frequency of old growth. Again, the moisture gradient from north to south is represented by the 3 forest zones. The north zone has the highest mean patch size of 107 acres, followed by the central zone with 71 acres, and the south zone with 46 acres. The grassland category has the overall smallest mean patch size of all vegetation categories with means ranging from 9 to 16 acres. Table III-9 displays the mean patch size, by acres, in each seral stage by vegetation category within each Forest zone.

Table III-9. Mean Patch Size

| Vegetation Category | Patch Size (acres) in Each Seral Stage 1/ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Forest Zone | SH | SN | PH | PN | EM | MM | LM | OG |
| Conifer Forests | | | | | | | | |
| North Zone | 26 | 31 | 100 | 67 | 93 | 98 | 34 | 107 |
| Central Zone | 28 | 44 | 81 | 20 | 35 | 47 | 55 | 71 |
| South Zone | 26 | 49 | 30 | 23 | 65 | 67 | 48 | 46 |
| Oak Woodlands | | | | | | | | |
| North Zone | - | - | - | - | 32 | 30 | - | - |
| Central Zone | - | - | - | - | 30 | 29 | - | - |
| South Zone | 8 | 31 | - | 25 | 46 | 54 | 54 | 35 |
| Grasslands | | | | | | | | |
| North Zone | - | 12 | - | - | - | - | - | - |
| Central Zone | - | 9 | - | - | - | - | - | - |
| South Zone | - | 16 | - | - | - | - | - | - |
| Hardwood Forests | | | | | | | | |
| North Zone | 11 | 28 | 13 | 80 | 51 | - | - | - |
| Central Zone | - | 7 | - | 27 | 25 | 21 | - | - |
| South Zone | - | 27 | - | 12 | 19 | 32 | 15 | 10 |

1/ Seral stages: SH = shrub harvest, SN = shrub natural, PH = pole harvest, PN = pole natural, EM = early mature, MM = mid mature,

LM = late mature, OG = old growth.

Patch frequency is also dominated by the conifer forest category. Table III-10 displays the percentages of vegetation in six patch sizes by Forest zones within vegetation categories. The highest frequency of patches larger than 1000 acres is found in the north zone. It accounts for 38 percent of the conifer forests in this zone. Significant reductions in large patches are found in the central and south zones where they account for 9 percent and 5 percent of the conifer forests, respectively. The central zone (44 percent) and south zones (40 percent) are generally dominated by patches less than 100 acres in size. Within the central zone much of this high frequency of small patches is the result of intensive forest management. In contrast, within the south zone fragmentation is due primarily to mixing of unlike vegetation types and high natural disturbance.

Table III-10. Patch Size Distribution

| Vegetation Category | Percent of Vegetation in Patch Size | | | | | |
|---|---|---|---|---|---|---|
| Forest Zone | 0-50 | 51-100 | 101-200 | 201-500 | 501-1000 | >1000 |
| **Conifer Forests** | | | | | | |
| North Zone | 15 | 8 | 10 | 16 | 13 | 38 |
| Central Zone | 25 | 19 | 17 | 21 | 9 | 9 |
| South Zone | 23 | 17 | 17 | 22 | 16 | 5 |
| **Oak Woodlands** | | | | | | |
| North Zone | 51 | 49 | - | - | - | - |
| Central Zone | 39 | 26 | 35 | - | - | - |
| South Zone | 25 | 14 | 18 | 23 | 12 | 8 |
| **Grasslands** | | | | | | |
| North Zone | 43 | - | 57 | - | - | - |
| Central Zone | 92 | 8 | - | - | - | - |
| South Zone | 54 | 15 | 12 | 12 | 6 | - |
| **Hardwood Forests** | | | | | | |
| North Zone | 17 | 19 | 19 | 29 | - | 17 |
| Central Zone | 83 | 8 | 9 | - | - | - |
| South Zone | 48 | 33 | 18 | - | - | - |

Patch Shape: Patch shape is important to a variety of wildlife species, particularly as it affects the amount of edge and interior. Patch shapes closer to circular will have less edge and greater interior acres. Perimeter/interior ratio is used here to describe patch shape due to its ease of use and clear relationship to interior habitat (Jimerson, T.M. et al., 1989). The measurement of patch shape is expressed as the perimeter/interior (PI) ratio:

PI ratio = edge perimeter (in 100s of feet)/interior acres

PI ratios of less than 1 are close to circular and usually have high interior acres. Those patches between 1 and 2 have greater amounts of edge and lower interior acres, while patches greater than 2 are composed mainly of edge and have low amounts of interior acres. Table III-11 displays the percentage of Forest in each PI ratio category by zone within each vegetation category.

Table III-11.
PI Ratio Category Distribution

| Vegetation Category | Percent of Forest in Perimeter/ Interior Ratio Category | | | |
|---|---|---|---|---|
| Forest Zone | < 1 | 1-2 | 2-5 | > 5 |
| Conifer Forests | | | | |
| North Zone | 57 | 33 | 10 | < 1 |
| Central Zone | 24 | 52 | 24 | 1 |
| South Zone | 30 | 55 | 15 | < 1 |
| Oak Woodlands | | | | |
| North Zone | - | 60 | 38 | 12 |
| Central Zone | - | 52 | 46 | 2 |
| South Zone | 25 | 56 | 19 | 1 |
| Grasslands | | | | |
| North Zone | - | 57 | 24 | 19 |
| Central Zone | - | 17 | 67 | 16 |
| South Zone | 8 | 44 | 45 | 3 |
| Hardwood Forests | | | | |
| North Zone | 31 | 23 | 44 | 2 |
| Central Zone | - | 30 | 48 | 23 |
| South Zone | 5 | 61 | 32 | 1 |

Within the conifer category in the north zone, 57 percent of the area is included in patches with PI ratios of less than 1, an additional 33 percent is found in patches with PI ratios between 1 and 2 (Table III-11). This follows the mean patch size and patch frequency analysis and demonstrates that the north zone has the lowest degree of fragmentation on the Forest. Both the central zone (52 percent) and south zone (55 percent) show the reverse scenario with the highest frequency of patches occurring in the PI ratio category of 1 to 2.

Patch Density: Patch density is a simple way of describing fragmentation. Patch density is expressed as the number of patches/100 acres. Table III-12 displays patch density in each zone within each vegetation type. Low patch density indicates a low level of fragmentation, while high patch density indicates a high level of fragmentation. Patch density varies by vegetation category. The conifer category has the lowest patch density of 1.3 to 2.0 patches/100 acres. The oak woodland

category also has a low density of patches, with a range of 2.2 to 3.4 patches/100 acres. The hardwood forest and grassland categories both have high patch densities of 1.9 to 9.5 patches/100 acres and 6.5 to 11.3 patches/100 acres, respectively.

When conifer patch density is examined by zone, the north zone again displays the lowest degree of fragmentation with a density of 1.3 patches per/100 acres.

Table III-12.
Fragmentation (Patch and Edge Density)

| Vegetation Category Zone | Fragmentation Measures Patch Density (patches/100 acres) | Edge Density (feet/acre) |
|---|---|---|
| Conifer Forests | | |
| North Zone | 1.3 | 113 |
| Central Zone | 2.0 | 160 |
| South Zone | 1.9 | 141 |
| Oak Woodlands | | |
| North Zone | 3.1 | 201 |
| Central Zone | 3.4 | 220 |
| South Zone | 2.2 | 151 |
| Grasslands | | |
| North Zone | 8.7 | 299 |
| Central Zone | 11.3 | 351 |
| South Zone | 6.5 | 220 |
| Hardwood Forests | | |
| North Zone | 1.9 | 195 |
| Central Zone | 9.5 | 348 |
| South Zone | 4.5 | 194 |

Edge Density: Edge density is also a good indicator of fragmentation. Edge density is expressed as edge feet/acres. Table III-12 displays edge density in each zone within each vegetation type. Again, low numbers indicate low fragmentation while high numbers indicate high fragmentation. Edge density analysis shows the same trends as the patch density analysis. The overall edge density is lowest in the conifer category and in the north zone at 113 feet/acre. Edge density increases with the oak woodland category at 151 to 220 feet/acre, hardwood forests at 194 to 348 feet acre, and the grassland category with the highest edge density at 220 to 351 feet/acre.

Snag and Log Components: Conifer forests in the Pacific Northwest are valued economically for their timber and as wildlife habitat (Harris,1984). Snags (standing dead trees) and logs are an important component of this wildlife habitat (USDA, 1986), and large snags are

considered as one of the distinctive features of old-growth forests (Franklin et al., 1981). Approximately Ninety percent of the terrestrial vertebrates that exist in our forests live or depend on such coarse woody debris (Franklin in press). Snags provide habitat for foraging, nesting, resting or cover for many species of wildlife (Thomas et al., 1979). Characteristics of snags, including state of decay, density, size, and species, influence their use by wildlife (Mannan et al., 1980; Maser et al., 1979; Raphael, 1980). For example, soft snags are most often used for nesting whereas hard snags are most often used for foraging. In addition, the diameter at breast height and height of snags determine which species will use a snag for nesting (Thomas et al., 1979).

The National Forests in the Pacific Southwest Region have established guidelines for the retention of snags. These guidelines are based on the work of Thomas and others (1979) in the Blue Mountains of Oregon. The guidelines are not specific to California nor are they specific to the vegetation types found on the Forest. Ecology plot sampling on unmanaged stands in the Six Rivers and Klamath National Forests provided us with an opportunity to examine snag and log densities by vegetation series. Table III-13 summarizes the data on over 1200 snag and log plots: it displays the total number of plots sampled within each vegetation series; it also displays the number of plots sampled, the mean number of snags and logs per acre by seral stage, and the standard error of the mean. Snags and logs described here are defined as being at least 20 inches dbh and either 10 feet tall or 10 feet long.

Table III-13.
Mean Snag and Log Densities

| Vegetation Series | Seral Stage | Number Plots | Snags/Acre Mean | Snags/Acre Std. Error | Logs/Acre Mean | Logs/Acre Std. Error |
|---|---|---|---|---|---|---|
| Tanoak | | 352 | | | | |
| | Shrub/Forb | 36 | 0.8 | 0.4 | 11.0 | 2.3 |
| | Pole | 14 | 0.6 | 0.6 | 15.7 | 3.9 |
| | Early Mature | 32 | 3.2 | 0.9 | 8.2 | 2.6 |
| | Mid Mature | 19 | 3.6 | 1.1 | 4.7 | 1.9 |
| | Late Mature | 33 | 1.3 | 0.4 | 1.8 | 0.7 |
| | Old Growth | 218 | 4.3 | 0.3 | 9.2 | 0.8 |
| White fir | | 433 | | | | |
| | Shrub/Forb | 6 | 0.0 | 0.0 | 2.0 | 1.6 |
| | Pole | 5 | 1.2 | 0.8 | 10.0 | 7.8 |
| | Early Mature | 40 | 1.7 | 0.3 | 4.0 | 1.4 |
| | Mid Mature | 79 | 5.2 | 0.6 | 5.3 | 1.3 |
| | Late Mature | 73 | 7.6 | 0.8 | 11.0 | 1.5 |
| | Old Growth | 230 | 5.9 | 0.3 | 13.5 | 0.9 |
| Red fir | | 124 | | | | |
| | Shrub/Forb | 0 | - | - | - | - |
| | Pole | 1 | - | - | - | - |
| | Early Mature | 7 | 4.6 | 2.5 | 6.3 | 3.8 |
| | Mid Mature | 19 | 6.5 | 1.2 | 7.7 | 2.0 |

| | | | | | |
|---|---|---|---|---|---|
| Late Mature | 32 | 7.2 | 1.1 | 9.7 | 2.3 |
| Old Growth | 65 | 8.2 | 0.8 | 11.4 | 1.6 |

Table III-13. continued
Mean Snag and Log Densities

| Vegetation Series | Seral Stage | Number Plots | Snags/Acre Mean | Snags/Acre Std. Error | Logs/Acre Mean | Logs/Acre Std. Error |
|---|---|---|---|---|---|---|
| Jeffrey pine | | 35 | | | | |
| | Shrub/Forb | 1 | - | - | - | - |
| | Pole | 0 | - | - | - | - |
| | Early Mature | 3 | 1.3 | 1.3 | 10.0 | 5.8 |
| | Mid Mature | 7 | 1.1 | 0.7 | 1.7 | 1.7 |
| | Late Mature | 6 | 3.0 | 1.5 | 5.0 | 2.2 |
| | Old Growth | 18 | 3.1 | 0.7 | 6.8 | 2.6 |
| Douglas-fir | | 168 | | | | |
| | Shrub/Forb | 29 | 0.3 | 0.3 | 17.3 | 3.5 |
| | Pole | 6 | 10.0 | 5.2 | 22.0 | 11.2 |
| | Early Mature | 13 | 3.7 | 1.5 | 16.0 | 8.0 |
| | Mid Mature | 17 | 1.2 | 0.6 | 5.4 | 1.5 |
| | Late Mature | 15 | 0.9 | 0.4 | 6.3 | 2.9 |
| | Old Growth | 88 | 3.9 | 0.4 | 8.7 | 1.6 |
| Port-Orford-cedar | | 102 | | | | |
| | Shrub/Forb | 1 | - | - | - | - |
| | Pole | 0 | - | - | - | - |
| | Early Mature | 0 | - | - | - | - |
| | Mid Mature | 4 | 4.0 | 1.6 | 16.0 | 9.8 |
| | Late Mature | 7 | 8.9 | 2.8 | 17.7 | 3.4 |
| | Old Growth | 90 | 7.6 | 0.7 | 16.6 | 2.0 |
| Oak woodlands | | 16 | | | | |
| | Shrub/Forb | 4 | 4.0 | 1.6 | 0.0 | 0.0 |
| | Pole | 0 | - | - | - | - |
| | Early Mature | 1 | - | - | - | - |
| | Mid Mature | 3 | 0.0 | 0.0 | 0.0 | 0.0 |
| | Late Mature | 1 | - | - | - | - |
| | Old Growth | 7 | 1.7 | 1.2 | 2.9 | 1.8 |

One conclusion drawn from the data presented in Table III-13 is that snag and log densities vary by vegetation series and seral stages. A second conclusion is that the Douglas-fir and tanoak series, the two most extensive series on the Forest, have relatively low densities of snags (3.9 and 4.3 snags/acre) and logs (8.7 and 9.2 logs/acre) in their old growth seral stages. This is particularly true when they are compared to the white fir and red fir series. What this points to is the need to utilize site specific snag and log data to maintain this important element of our wildlife habitat.

Process Elements:

Landscape patterns are dynamic; they change over time and space and can be described as a shifting mosaic (Crow, 1991). The principle mechanisms of change are geomorphological, taking place over long periods of time; species colonization; and disturbance, which occurs over a shorter period of time (Forman and Godron, 1986).

Geomorphic processes within the Forest have shaped the Forest's landscapes and are largely responsible for much of the current vegetation pattern. For example, mass soil movement has left behind areas of shallow soils now dominated by grasslands, while landslides have left behind rocky headscarps, with little or no soil, that are now occupied by canyon live oak.

Species colonization has had a dramatic effect on the Forest's grasslands. Prior to European colonization they were dominated by native perennial grasses, currently they are dominated by non-native annual grasses (Davy, 1902). These changes resulted from a combination of invasion by alien species, livestock grazing, and fire (Heady, 1988).

Disturbance has had by far the greatest impact on vegetation patterns within the Forest. The primary disturbance agents have been fire, timber management and cattle grazing. Fire has resulted in the pattern of seral stages spread across the Forest. The frequency of fire return is affected by topographic position. For example, ridgetop and upper one-third slopes burn with much higher frequency than lower one-third slopes. As recently as 1987, a fire in the upper one-third slope in the south zone converted over 5,000 acres of mid mature coniferous forest to the shrub/forb seral stage. In addition, large scale stand replacing wildfires which occurred between 1870 and 1920 are responsible for the dominance of vegetation in the early and mid mature seral stages. Much of this vegetation is found in the ridgetop and upper one-third slope positions. Native American burning practices have also impacted vegetation patterns in parts of the Forest, but to a much lesser extent than natural wildfires.

Timber management was also a selective agent of succession on the Forest. Late seral and old growth stands, many of which were located in the lower one-third slope position, were selected for regeneration harvests. This further emphasized the landscape dominance of younger seral stages. Cattle grazing has also played its part in disturbance. Cattle act as selective agents of succession. They eat palatable species and leave behind non-palatable ones, which may eventually dominate a site.

Disturbance is the triggering mechanism for succession. Succession can move either backward or forward depending on the type, intensity, and duration of the disturbance. Succession is an ongoing process on the Forest. It can be altered or accelerated by disturbance.

Historic Range of Terrestrial Vegetation Variability

Determining the historic range of variability (HRV) for forest vegetation has been proposed as a tool to be used in ecosystem management to develop management schemes that mimic natural processes and functions. The examples described below are based on the three forest zones described earlier.

The environmental indicators selected for this HRV analysis include vegetation series and their seral stages. Vegetation series were selected for analysis because 1) they are of sufficient grain and extent to describe natural disturbance events without being dominated by them, 2) they are thought to represent a narrow range of environment, 3) they carry with them a discrete disturbance regime, 4) they include primarily long-lived coniferous forests that over the time frame of this analysis appear to be the natural community, 5) they have distinct climate associated with their position near the Pacific Ocean, and 6) large-scale disturbance events appear to be infrequent. For the purpose of this analysis we recognize historic as including disturbance, climate, and indigenous people.

A coarse-filter analysis is used here to examine the historic range of terrestrial vegetation variability. It is conducted at a scale sufficiently large enough (three Forest zones) to examine ecosystem process and function over a 200-year time period suitable to the attributes we are measuring (vegetation series and seral stages) (King, 1993), and compared with existing conditions. The assumption of this coarse-filter analysis is that maintaining representative examples of various community types will protect viable populations of most species (85-90 percent) and maintain biological diversity (Noss, 1987; Hunter, 1991).

The historic range of variability is calculated for the 200 year period from 1790 to 1990 for this example. Trying to reconstruct the historic range of variability before 1790 would be very difficult, even in very old ecosystems, because of the lack of information on climate and disturbance regimes (Atzet, 1993).

The purpose of this analysis is to describe a range of seral stage conditions by forest zone and vegetation series that could be used under an ecosystem management strategy to manage for healthy, sustainable ecosystems.

The historic range of variability analysis is based on the vegetation mapping project. Vegetation was mapped on a combination of aerial photos and ortho quads using 1990 as the base age. Ortho quad overlays were drafted and scanned into the Distributed Wildland Resource Information System (DWRIS) (USDA, 1987), a geographic information system, for analysis. The ecology data base for northwest California (Jimerson, 1993) was used to calculate the age distribution within each seral stage, frequency of 50 year age classes within the old-growth seral stage, mean stand age by series, and slope position. The seral stage age distributions used in the HRV analysis were calculated from this data base.

Table III-14 displays the average age range of seral stages in the tanoak/Douglas-fir and white fir/red fir series. These four series were selected for the historic range of variability (HRV) analysis since they are the primary conifer series on the Forest subject to intensive forest management, and they make up a large proportion (83 percent) of the Forest.

Table III-14.
HRV Seral Stage Age Ranges

| Vegetation Series<br>Seral Stage | Age Range<br>(Years) |
|---|---|
| Tanoak/Douglas-fir Series | |

| | |
|---|---|
| Shrub/Forb | 0-35 |
| Pole | 36-70 |
| Early Mature | 71-110 |
| Mid Mature | 111-150 |
| Late Mature | 151-200 |
| Old-growth | > 200 |

White Fir/Red Fir Series

| | |
|---|---|
| Shrub/Forb | 0-35 |
| Pole | 36-70 |
| Early Mature | 71-110 |
| Mid Mature | 111-160 |
| Late Mature | 161-180 |
| Old-growth | > 180 |

The HRV was calculated using the information described above. The first step was to return each harvest unit to its pre-harvest seral stage in order to determine the current condition without harvesting. The second step was to grow the stands backward in time, in four 50-year increments, and calculate the percentage of each seral stage in each vegetation series in the four increments; the highest and lowest percentages define the HRV. The third step was to calculate the historic mean (average) percentage of each seral stage in each vegetation series in the four 50-year increments of the 200 year period. The final step was to compare the existing condition (including harvest) to the HRV. The principal comparisons by zone and series were made using the old-growth seral stage, since this is the seral stage that has been subjected to the most intensive forest management. The shrub/forb and pole seral stages were also examined. These are the two seral stages containing the results of our intensive forest management. When harvests are removed, they give us a good idea of the frequency and extent of natural disturbance by series and forest zone.

Tables III-15 through III-17 display the results of the historic range of variability analysis by zones; these tables indicate what percentage of a vegetation series was in each seral stage during the period 1790 to 1990, both as an historic range and an historic mean, and what percentage of a vegetation series is in each seral stage now (existing condition).

There is a general trend within the north zone toward narrower ranges of variability in the old-growth seral stage as we increase in elevation from the tanoak series (29-48 percent) on low elevation sites, to the red fir series (14-18 percent), on the higher elevation sites. This again points to the higher frequency of stand replacing wildfires on high elevation sites when compared to low elevation sites. A second general trend is the high frequency of tanoak vegetation in the shrub/forb and pole seral stages (25 percent). This is primarily related to intensive forest management which accounts for 18 percent of the vegetation, compared to 7 percent resulting from natural disturbance over the same time period. A third general trend is found in the comparison of the existing condition within the old-growth seral stage of the tanoak series (25 percent), to the historic range of variability (29-48 percent). This indicates that the old-growth seral stage is deficient when compared to a historic disturbance regime. This is much more obvious when we return the harvested stands to their previous seral stages and recalculate the amount of old-growth in the tanoak series as 43 percent. A

fourth general trend observed here is that the tanoak series appears to be the only series whose existing condition falls outside the historic range of variability. This is clearly related to the amount of old-growth logging that has taken place in this series due to its easily accessible, lower slope position. Table III-15 compares the historic (1790-1990) range of variability within four vegetation series in the north zone to the condition the Forest in 1990 had there been no large-scale logging (1990 PR), and the existing conditions as percentages of the series in each seral stage.

Table III-15.

North Zone Historic Range of Variability,
Historic Mean, and Existing Condition

| Vegetation Series Seral Stage | Historic Range of Variability | Percent of Series Historic Mean | 1990 PR Condition | Existing Condition |
|---|---|---|---|---|
| Tanoak | | | | |
| Shrub/Forb | 1-19 | 1 | 7 | |
| Pole | 1-21 | 1 | 18 | |
| Early Mature | | 9-25 | 25 | 25 |
| Mid Mature | 2-23 | 23 | 23 | |
| Late Mature | 2-13 | 2 | 2 | |
| Old Growth | 29-48 | 48 | 25 | |
| Douglas-fir | | | | |
| Shrub/Forb | 2-20 | 2 | 7 | |
| Pole | 3-19 | 3 | 6 | |
| Early Mature | | 7-23 | 19 | 19 |
| Mid Mature | 2-29 | 29 | 29 | |
| Late Mature | 2-16 | 2 | 2 | |
| Old Growth | 27-45 | 45 | 37 | |
| White Fir | | | | |
| Shrub/Forb | 6-24 | 6 | 7 | |
| Pole | 8-27 | 8 | 8 | |
| Early Mature | | 13-34 | 34 | 34 |
| Mid Mature | 3-20 | 20 | 20 | |
| Late Mature | 1-12 | 1 | 1 | |
| Old Growth | 23-31 | 31 | 29 | |
| Red Fir | | | | |
| Shrub/Forb | 5-29 | 5 | 5 | |
| Pole | 11-33 | 11 | 11 | |
| Early Mature | | 14-40 | 40 | 40 |
| Mid Mature | 3-26 | 26 | 26 | |
| Late Mature | 1-10 | 1 | 1 | |
| Old Growth | 14-18 | 17 | 17 | |

A fifth general trend is observed within the central zone; the historic range of variability for old-growth begins to drop as we move south into drier areas (see Tables III-15 to III-17). This is not a surprising result since one would expect a lower frequency of old-growth to be associated with a drier climate. The Douglas-fir series is a perfect example of this. Douglas-fir old-growth ranges from 27-45 percent in the north zone, compared to a range of 22-34 percent in the central zone and 7-20 percent in the south zone. The shrub/forb and pole seral stages show a converse result by increasing in extent. Table III-16 compares the historic (1790-1990) range of variability within three vegetation series in the central zone to the condition of the Forest in 1990 had there been non large-scale logging (1990 PR), and the existing conditions as percentages of the series in each seral stage.

Table III-16.

Central Zone Historic Range of Variability,
Historic Mean, and Existing Condition

| Vegetation Series | Percent of Series Historic Seral Stage | Range of Variability | 1990 PR Condition | Existing Condition |
|---|---|---|---|---|
| Tanoak | | | | |
| | Shrub/Forb | 4-20 | 4 | 16 |
| | Pole | 2-18 | 2 | 24 |
| | Early Mature | 11-18 | 11 | 11 |
| | Mid Mature | 11-19 | 18 | 19 |
| | Late Mature | 9-19 | 15 | 11 |
| | Old Growth | 22-50 | 50 | 19 |
| Douglas-fir | | | | |
| | Shrub/Forb | 2-21 | 2 | 9 |
| | Pole | 2-21 | 2 | 5 |
| | Early Mature | 13-23 | 22 | 22 |
| | Mid Mature | 10-27 | 27 | 27 |
| | Late Mature | 9-14 | 12 | 11 |
| | Old Growth | 22-34 | 34 | 26 |
| White Fir | | | | |
| | Shrub/Forb | 1-17 | <1 | 6 |
| | Pole | 1-16 | <1 | 5 |
| | Early Mature | 15-23 | 23 | 23 |
| | Mid Mature | 11-20 | 20 | 20 |
| | Late Mature | 8-16 | 15 | 15 |
| | Old Growth | 30-41 | 41 | 31 |

A sixth general trend is observed in the south zone; here it is apparent that the greatest degree of change occurs. For instance, in the white fir series in the north zone the frequency of old-growth is 23-31 percent, compared to 30-41 percent in the central zone, and 8-11 percent in the south zone (see Table III-17). This is thought to be related to the shift in climate associated with the change from the Klamath Mountains Section (USDA, 1993) to the North Coast Mountains Section in which the south zone is found. This shift is much greater than the north-south moisture gradient associated with the Klamath Mountains Section. Not only does the climate change between these Sections, but the parent rock shifts from fine textured metamorphics in the Klamath Mountains Section to coarse textured sandstones in the North Coast Mountains Section. This change further adds to the drier conditions in the south zone and contributes to the higher frequency of stand replacing wildfires. Table III-17 compares the historic (1790-1990) range of variability within three vegetation series in the south zone to the condition the Forest in 1990 had there been no large-scale logging (1990 PR), and the existing conditions as percentages of the series in each seral stage.

Table III-17.

South Zone Historic Range of Variability,
Historic Mean, and Existing Condition

| Vegetation Series | Seral Stage | Percent of Series Historic Range of Variability | Historic Mean | 1990 PR Condition | Existing Condition |
|---|---|---|---|---|---|
| Tanoak | | | | | |
| | Shrub/Forb | 0-28 | 0 | 6 | |
| | Pole | 1-27 | 1 | 6 | |
| | Early Mature | | 12-36 | 15 | 15 |
| | Mid Mature | 8-36 | 36 | 36 | |
| | Late Mature | 5-19 | 19 | 19 | |
| | Old Growth | 21-29 | 18 | 18 | |
| Douglas-fir | | | | | |
| | Shrub/Forb | 1-33 | 1 | 6 | |
| | Pole | 1-32 | 1 | 5 | |
| | Early Mature | | 16-40 | 35 | 32 |
| | Mid Mature | 7-40 | 40 | 37 | |
| | Late Mature | 2-14 | 14 | 14 | |
| | Old Growth | 7-20 | 8 | 7 | |
| White Fir | | | | | |
| | Shrub/Forb | 4-32 | 4 | 8 | |
| | Pole | 2-29 | 2 | 5 | |
| | Early Mature | | 18-36 | 35 | 30 |
| | Mid Mature | 8-35 | 35 | 32 | |
| | Late Mature | 4-13 | 13 | 13 | |
| | Old Growth | 8-11 | 1 | 11 | |

Table III-18 compares the historic ranges of variability for the major forest series with the condition of the Forest in 1990 had there benn no large-scale logging (1990 PR), and the existing condition in all three zones. Here a seventh general trend becomes apparent: the amount of vegetation associated with the mature seral stages shifts in relation to the amount of old-growth. For example, in the south zone where the old-growth seral stage is at its lowest frequency in the forest, the mature seral stages reach their highest frequencies. This is thought to be related to the extensive stand replacing wildfires that swept the Forest between 1870-1930. The juxtaposition of the south zone within the drier North Coast Mountains Section would therefore be expected to display the highest frequency of mature vegetation.

Table III-18.
Comparison of Historic Range of Variability (HRV), Existing Condition (EC), and 1990 Pre-Logging Condition (PR)1 in All Zones.

| Vegetation Series | Percent of Series North Zone | | | Central Zone | | | South Zone | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Seral Stage | HRV | EC | PR | HRV | EC | PR | HRV | EC | PR | |
| **Tanoak** | | | | | | | | | | |
| Shrub/Forb | 1-19 | 7 | 1 | 4-20 | 16 | 4 | 0-28 | 6 | 0 | |
| Pole 1-21 | 18 | 1 | 2-18 | 24 | 2 | 1-27 | 6 | 1 | | |
| Early Mature | | 9-25 | 25 | 25 | 11-18 | 11 | 11 | 12-36 | 15 | 15 |
| Mid Mature | 2-23 | 23 | 23 | 11-19 | 19 | 18 | 8-36 | 36 | 36 | |
| Late Mature | 2-13 | 2 | 2 | 9-19 | 11 | 15 | 5-19 | 19 | 19 | |
| Old Growth | 29-48 | 25 | 48 | 22-50 | 19 | 50 | 21-29 | 18 | 29 | |
| **Douglas-fir** | | | | | | | | | | |
| Shrub/Forb | 2-20 | 7 | 2 | 2-21 | 9 | 2 | 1-33 | 6 | 1 | |
| Pole 3-19 | 6 | 3 | 2-21 | 5 | 2 | 1-32 | 5 | 1 | | |
| Early Mature | | 7-23 | 19 | 19 | 13-23 | 22 | 22 | 16-40 | 32 | 35 |
| Mid Mature | 2-29 | 29 | 29 | 10-27 | 27 | 27 | 7-40 | 37 | 40 | |
| Late Mature | 2-16 | 2 | 2 | 9-14 | 11 | 12 | 2-14 | 14 | 14 | |
| Old Growth | 27-45 | 37 | 45 | 22-34 | 26 | 34 | 7-20 | 7 | 8 | |
| **White Fir** | | | | | | | | | | |
| Shrub/Forb | 6-24 | 7 | 6 | 1-17 | 6 | <1 | 4-32 | 8 | 4 | |
| Pole 8-27 | 8 | 8 | 1-16 | 5 | <1 | 2-29 | 5 | 2 | | |
| Early Mature | | 13-34 | 34 | 34 | 15-23 | 23 | 23 | 18-36 | 30 | 35 |
| Mid Mature | 3-20 | 20 | 20 | 11-20 | 20 | 20 | 8-36 | 32 | 35 | |
| Late Mature | 1-12 | 1 | 1 | 8-16 | 15 | 15 | 4-13 | 13 | 13 | |
| Old Growth | 23-31 | 29 | 31 | 0-41 | 31 | 41 | 8-11 | 11 | 11 | |
| **Red Fir** | | | | | | | | | | |
| Shrub/Forb | 5-37 | 5 | 5 | | | | | | | |
| Pole 11-33 | 11 | 11 | | | | | | | | |
| Early Mature | | 14-40 | 40 | 40 | | | | | | |
| Mid Mature | 3-26 | 26 | 26 | | | | | | | |

| | | | |
|---|---|---|---|
| Late Mature | 1-10 | 1 | 1 |
| Old Growth | 14-18 | 17 | 17 |

1 The 1990 pre-logging condition is the condition the Forest would be in had there been no large-scale commercial logging.

Opportunities

The Forest is currently conducting an ecological classification program, mapping vegetation forest wide, and conducting ecological unit inventories (EUI). The objective of the ecological classification program is to describe plant associations along with their physiographic features (elevation, aspect, slope, soils, parent rock, for example) into units called ecological types. The objective of the vegetation mapping project is to complete a vegetation map layer for the Forest which includes vegetation series and sub-series, seral stage, overstory size class, and canopy closure. It is anticipated that this project will be completed in 1995.

The objective of coordinated resource inventory is to map ecological types, existing vegetation, soils, and geology and to integrate this data into ecological units. The areas selected for coordinated resource inventory are those that require this site specific information to address management concerns or needs, such as watershed assessments. These ecological types when described and mapped will provide the future vegetation management units for the Forest. It will allow for tracking the elements of vegetative diversity (species, community, ecosystem, landscape) throughout the Forest. At present preliminary classification has been completed for about 90 percent of the Forest; mapping is completed on about 800,000 acres. Future classification efforts and EUI will be conducted in areas where this type of information is needed in order to develop ecologically sound management strategies.

Affected Environment in Context with Alternatives

The effects of the management alternatives on biological diversity are analyzed in Chapter 4.

## GENETICS

### Introduction

The issue surrounding genetics relates to maintaining genetic variability as an aspect of biological diversity.

### Current Situation

The Six Rivers is known for its diverse climate and topography and the corresponding richness of its native flora and fauna. This wealth of diversity represents an extensive gene pool. In general, the larger the gene pool the greater the number of potential genotypes. This quality of the genetic community is known as genetic variability and is essential to the ability of species to adapt and survive. Genetic variability, then, is a measure of the number of genetic combinations available to

any given species and is a function of the genotype population of the gene pool. Species population and distribution determine gene pool population, and so species success in nature is in direct ratio to genetic variability. Genetic variability results in genetic diversity, which in turn is the basis for all biological diversity, culminating in diverse species, communities, and ecosystems.

Genetic variability, particularly in rare and endangered wildlife species and species with a heavy emphasis on economic or recreational utility, such as Douglas-fir or anadromous fish, is an important consideration in Forest management. The long-term viability of these species and the many others which make up the Six Rivers ecosystems depends on their ability to meet changing conditions, a function of genetic variability. For instance, when wildlife species lose connecting habitat between subpopulations, effectively isolating them, the gene pool for those species also becomes fragmented and begins to lose variability.

There are two ways to conserve genetic variability: “in situ” (in the species’ natural environment) and “ex situ” (outside their natural environment; for example, in a tree nursery or fish hatchery, or in seed banks and arboreta). For Douglas-fir, the Forest Service has the ability to perform both in situ and ex situ gene conservation. For salmon and steelhead, the Forest Service has responsibility for habitat management only (in situ). Work with the fish populations themselves is the responsibility of the CDF&G.

Genetic diversity propagates naturally in places largely undisturbed by man’s activities. Some areas on the forest are basically untouched, including Wilderness and roadless areas, areas producing non-commercial species of timber or areas not capable of producing timber, and roaded and timbered areas not yet harvested. The size and distribution of these areas allow for adequate gene conservation in natural tree stands. Another example is small creeks on the Forest, which promote natural selection of fish. The Forest Service’s responsibilities here include habitat maintenance. Both of these are examples of “in situ” gene conservation.

Genetic diversity can also be conserved using seedlings from nurseries. These seedlings come from seed collected within genotypic zones consisting of one or more genotypes, meaning the seed is taken from one or more stands at a certain elevation band over a broader area recognized as a breeding zone. When the seedlings are outplanted they are returned to the zone from which they were collected, not only conserving that zone’s unique genotypes but maintaining the ability of harvested areas to continue to create new genotypes over time.

Opportunities

Threats to biodiversity from resource use that exceeds sustained yield capacities, from habitat fragmentation, pollution, plantation failure, fire, and pest infestation can shrink the gene pool by losing genotypes faster than they can be replaced. Examples are areas which were forested but are now unstocked or understocked due to fire, pest damage, or plantation failure, areas of formerly contiguous habitat that have become fragmented, and rivers and creeks planted with salmonids from hatcheries without genetic improvement programs. Hazardous waste dumping on Forest land can also affect salmon, steelhead, and other aquatic life if it infiltrates the groundwater.

The Pacific Southwest Forest and Range Experiment Station has a Center for Conservation of Genetic Diversity. The Center has begun research on coniferous and broadleaf trees, herbaceous

plants, and wildlife. Plans are being developed for research on threatened wildflowers, endangered wildlife, and salmon. Opportunity taken for cooperation with the Center and consideration of genetic diversity in site specific project management design will help conserve biodiversity. Genetic studies have been conducted on one rare plant species (Bensoniella oregana) and on grass species to help discern the extent of genetic variation. The latter will help guide plant collection efforts.

### Affected Environment in Context with Alternatives

The potential effects of Forest management direction on genetics are essentially the same for all management alternatives and are not discussed further in Chapter 4. The potential effects of specific projects on genetics will be considered during the project-level NEPA process.

## RIPARIAN ZONES

### Public Issues

Issue 3 How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems?

### Introduction

Riparian ecosystems are the interface between the aquatic and terrestrial ecosystems and encompass a wide range of environmental factors, ecological processes, and biotic communities. Riparian communities occur around streams, lakes, ponds, wet meadows, springs, and wetlands throughout the Forest. Local slope, aspect, elevation, soil type, and geology influence the width, density, and diversity of riparian vegetation.

Riparian areas are not easily delineated because they are comprised of mosaics of landforms, communities, and environments within the larger landscape. Aquatic habitat and ecological functions and processes in streams are strongly influenced by riparian area characteristics. Width of the riparian area and the magnitude of its influence on a stream are related to stream size and local topography. Riparian areas provide sources of large wood, shade, food resources, nutrients, and habitat. An ecologically functional riparian area is an essential component of a productive aquatic ecosystem. Many fishes and amphibians depend on wood-created habitat in headwater streams. Riparian travel and dispersal corridors for numerous terrestrial animals and plants and connectivity of the watershed area are also an important benefit.

A riparian area may or may not have true riparian vegetation that is water dependent, such as willows. The term “riparian area” defines a stream-side area where management activities are constrained to maintain the integrity of the channel and adjacent area. In a coniferous watershed, the riparian area along a small perennial stream will often be dominated by conifers, with only occasional deciduous species. The riparian area along intermittent channels will often demonstrate no vegetative change from that of the adjacent hill-slope. Riparian areas dominated by true riparian

vegetation are very limited on the Forest, probably comprising less than 10 percent of designated riparian zones.

Current Situation

Occurrence and Extent: Approximately 159,000 acres of riparian areas occur throughout the Forest. Sixty-five wet meadows and 90 ponds and lakes have been found on the Forest. Most wet meadows occur primarily at elevations between 3,500 and 6,000 feet and vary in size from 5 acres to more than 30 acres. Meadows are extremely rich in vegetation and may contain up to 100 different plant species. Ponds and lakes vary in size from less than 1 acre to more than 20 acres. The permanence of water and types of aquatic and emergent vegetation vary among ponds. The vegetation immediately adjacent to most meadows, ponds, and lakes generally occurs in a natural state.

Riparian areas usually contain several important resources, and often optimizing their use results in conflict. For example, the best timber stands or cattle grazing areas often occur in valley bottoms adjacent to productive salmonid streams. Grazing by sheep and cattle has occurred on the Forest for more than 100 years. An estimated 40,000 to 60,000 sheep were grazed in the Forest portion of the North Fork Eel River watershed during the period from 1870 to 1895 (Keter, 1994). This long period of grazing has resulted in alteration of the extent and vegetative character of riparian areas, but pre-1870 conditions are unknown. Common impacts of grazing on riparian areas are reduced riparian vegetation, trampled stream banks, and erosion on cattle trails. Each of these impacts has been observed on the Forest, but no overall watershed-by-watershed assessment has been done.

Uncontrolled logging of riparian areas often occurred on the Forest prior to establishment of Regional guides in the late 1960s. The common result was removal of streamside vegetation causing destabilization of the channel. The Forest has had guidelines since 1969 for streamside protection that limited logging damage along channels, but still allowed harvest of conifers from the riparian area. Salvage of dead or dying trees has removed many trees that could potentially have fallen into the stream and provided valuable fish habitat. Salvage of post-flooding accumulations of large woody debris has also removed a source of complex in-stream habitat for salmonids. In 1979 the Forest established standards and guides for streamside areas that provided much more protection for riparian areas. Commercial harvest was excluded in the riparian area of perennial streams, but was permitted on a case-by-case basis along intermittent or perennial channels. Maintaining shade canopy is a primary objective of current management of riparian areas on the Forest.

Maximum utilization of forage and timber may be incompatible with maintenance of productive riparian areas. In order to maintain the long-term productivity of riparian areas, the allocation of resource uses must be balanced with the goal of ecological sustainability.

Riparian Dependent Resources: Riparian areas provide habitat for a greater number of wildlife species than do other habitat types. At least 250 wildlife species use riparian areas for breeding, feeding, and resting. In addition to food, cover, and water, riparian areas generally provide wildlife species with cool micro-climates, increased vertical and horizontal layering of vegetation, increased edge effect, travel lanes, and connectors between habitat types. The interface of riparian and other vegetation types contributes to the forest biodiversity.

Relationship between riparian areas and fish habitat: Riparian vegetation is important to fish habitat in providing shade for temperature control, maintaining channel and bank stability, and providing cover through roots and overhangs. Down woody debris accumulates in the riparian areas and is important in dissipating stream energy, storing and routing sediment, depositing needed spawning gravels, scouring pools, and providing for stream complexity and diversity.

Large woody debris such as down trees and limbs is an important factor in influencing whether sediment inputs affect channel stability and aquatic habitat. A stream that is lacking in large woody debris tends to be more uniformly broad and shallow with fewer pools and spawning gravel accumulations and is more prone to channel scour by flood flows. Riparian areas protect water quality by filtering sediment and providing vegetation needed to stabilize stream banks.

Floodplains provide energy relief during high flows to prevent channel scouring and loss of spawning gravels. The storage capacity and vegetation of the floodplain help to reduce the water's velocity by spreading the flow out over a large area. Reduced flows over a floodplain typically result in sediment deposits, which in turn renew spawning gravel deposits and increase fertility of floodplains for plant growth.

Other Riparian Uses: In addition to providing aquatic and wildlife habitats, riparian areas are also the focus of water-related recreation uses such as fishing, hunting, camping, and hiking. Alteration of riparian areas has occurred due to timber harvest, road construction, recreation, mining, and livestock grazing as well as natural events such as floods and landslides. As is common throughout the Pacific Northwest, riparian systems on the Forest have been altered extensively over the past 150 years (Sedell and Luchessa, 1982). Streams have been cleared for navigation and log transport and streamside forests were cleared for wood salvage and fuelwood. Past practices in some areas resulted in overzealous log jam removal programs that have left some areas devoid of debris. A primary fish enhancement activity through the 1970s was removal of log jams (natural and man induced) to improve adult fish passage, which has resulted in decreased rearing habitat and downstream effects of released sediments. The ever increasing demand for wood products and more efficient use of timber has left less debris available for riparian systems (Murphy and Meehan, 1991).

Opportunities

Management of Riparian Areas: Considered collectively, the range of forest management activities influences the productivity of riparian systems, both positively and negatively. Also, any given management activity can vary as to its effect based on location in a watershed. Small streams contribute a large proportion of the biotic production and are key in maintaining habitat quality downstream, but they are also most easily impacted by management due to their intricate relationship to the terrestrial community. By comparison, large channels, which incorporate and process inputs from upstream and are not solely dependent on adjacent terrestrial input, are less likely to be adversely affected by the same activity. Therefore, to minimize negative effects, a riparian system must be managed on a watershed-landscape scale as an integrated whole unit, where headwater tributaries and down river main channels are given equal and relevant consideration.

Some of northwestern California's valuable aquatic resources are in jeopardy, and action is needed to prevent further decline. Management direction for wetlands and riparian areas is needed to

protect these communities for wildlife, fish, and water uses. To address the question of the issue of how the Forest will manage riparian systems, the Forest Plan and the preferred alternative must be referenced. To protect and restore riparian processes and maintain sustainable production of riparian resources, the Plan designates riparian management zones and prescribes management to insure high quality aquatic habitat and functioning riparian ecosystems now and in the future. Direction and standards and guidelines address all applicable management activities throughout the range of stream sizes and riparian communities on the Forest, as well as set desired future conditions.

General direction for meeting objectives for riparian ecosystems is also directed by Federal legislation, including the National Forest Management Act, as well as various Forest Service manuals and handbooks.

Affected Environment in Context with Alternatives

The effects of the various alternatives on the riparian zone are analyzed in Chapter 4.

## SENSITIVE PLANT SPECIES

### Public Issue

Issue 9 How will sensitive plant populations be managed?

### Introduction

Federally listed threatened and endangered (T&E) plants are protected under the Endangered Species Act (ESA) of 1973, as amended. The goal of the Forest is to ensure that management actions are not likely to jeopardize the continued existence of endangered, threatened, or sensitive plant species.

In order to do this the Forest will implement and maintain an up-to-date inventory of sensitive species to track the health of populations through monitoring, develop species and species habitat management guides, and undertake restoration and/or other conservation measures.

### Current Situation

Federally listed endangered plants are also protected under the ESA. An endangered species is one which is “in danger of extinction throughout all or a significant portion of its range.” Under the endangered plant provisions, removing or maliciously damaging endangered species is prohibited (16 U.S.C. 1538 (a)(2)). The U.S. Fish and Wildlife Service (USFWS) is the lead agency in administering the ESA. If T&E species are affected by a proposed action, either informal or formal consultation with the USFWS is required. Te Forest supports a very close relative of the Federally endangered McDonald’s rock-cress (Arabis macdonaldiana East.). Currently, the USFWS only recognizes a population that occurs in Mendocino county as endangered. Pending taxonomic research on the Arabis group (Vorobik, 1990), USFWS will re-evaluate the status of the Del Norte population.

Sensitive species are those species "known or suspected to occur on National Forest System (NFS) lands that are considered viable candidates for Federal threatened or endangered classification under the ESA" (California Native Plant Society, 1988). The Regional Forester assigns a species to the sensitive plant list based upon information on its status generated from a variety of sources, including the USFWS, California Department of Fish and Game (CDF&G), California Natural Diversity Database (under the Natural Heritage Division of CDF&G) and the California Native Plant Society (CNPS). Sensitive species, although not subject to the Endangered Species Act, receive special management emphasis to ensure their continued viability and preclude trends toward endangerment which would result in the need for Federal listing. Sensitive species lists are periodically updated to accommodate new information and/or status changes. In general, Federally listed C1 and C2, and CNPS List 1B plants are included on the sensitive plant list. Plants which are categorized otherwise, such as CNPS List 2 or CNPS List 4, can also be a part of the list; however, if a trend toward Federal listing is not suspected, their addition to the sensitive plant list is not appropriate. The Forest will be considering the development of a Special Interest Plant list that will harbor these rare but non-sensitive species. Inclusion on this list will allow for varying degrees of protection (for example, if a Special Interest Plant is noted during a project survey, mention will be made of the occurrence and mitigations recommended).

There are 30 plants on the Forest sensitive plant list (See Forest Plan Appendix C). Of the 30 species on the list, 19 are known to occur on the Forest. Suitable habitat exists on the Forest for the other nine species. Three state-listed species are on the Forest's sensitive plant list: Humboldt milk-vetch (Astragalus agnicidus Roll.) is state listed endangered; Benson's saxifrage (Bensoniella oregona (Abrams & Bacig) Morton) and leafy reed grass (Calamagrostis foliosa Kearn) are state listed rare. In 1994, recommendations were made to the Regional Forester to add and remove certain taxa to reflect changes in the status and nomenclature of species per publication of the California Native Plant Society inventory (1994) and the Jepson manual. Until the recommendations are approved, the existing plant list is in effect.

About 80 percent of the sensitive species are found on dry, rocky serpentine sites with soils which are nutrient poor and even toxic to most species. For example, McDonald's rock-cress is found associated with serpentine areas in the North Fork Smith River drainage. The Forest populations are healthy and robust, yet restricted in their range. McDonald's rock-cress is one member of the species group associated with serpentine parent material. Waldo rock-cress (Arabis aculeolata Greene), Waldo buckwheat (Eriogonum pendulum S. Wats.), Oregon bleeding heart (Dicentra formosa (Haw.) Walp. ssp. oregana (Eastw.) Munz), opposite-leaved lewisia (Lewisia oppositifolia (Wats.) Rob. in Gray) and McDonald's rock-cress can occur in similar habitats. The remaining species are associated with ultramafic parent material other than serpentine, non-serpentine outcrops, oak woodland/grasslands, and wet meadows/bogs.

Species and habitat management guides are developed for each species or species group occupying a particular habitat. To date, two draft management guides have been developed, for Tracy's sanicle (Sanicula tracyi Shan & Const.) and Benson's saxifrage. An implementation schedule for guide development is listed in Table V-1 in the Forest Plan.

The ESA requires development of a recovery plan for each species listed as endangered. A recovery plan has been written for McDonald's rock-cress (USFWS, 1984). The recovery plan only addresses populations of McDonald's rock-cress located on Red Mountain in Mendocino County. The

decision to incorporate the Del Norte populations into the plan is pending a published treatment of the species (Vorobik, 1990) which will formally clarify taxonomic questions.

Management activities which have the potential to negatively impact sensitive plant populations and their habitats include road construction, mining, and recreation use (illegal off-highway vehicle use, pedestrian use, horseback riding). The potential conflicts between timber harvest and sensitive species are minimized due to the unsuitability of most sensitive plant environments to timber production (low productivity serpentine soils).

Mining and related activities have the greatest potential to impact many sensitive plants. Ultrmafic parent material support numerous sensitive plants but also contain strategically important minerals such as chromium and nickel (US Fish and Wildlife Service, 1984; Bio-Flora Research, Inc., 1985).

Species such as pale yellow stonecrop (Sedum laxum (Britton) Berger ssp. flavidum Denton), Waldo buckwheat, Oregon bleeding heart, and opposite-leaved lewisia, associated with outcrops and rocky sites, are affected primarily by road construction. Outcrops often lie along ridges which are suitable for road construction and/or provide a rock source for road construction.

Potential recreational pressures on sensitive and rare plant resources include vehicular access, camping, mountain biking, hiking, horseback riding, and off-highway vehicle (OHV) use. Impact is direct through trampling and indirect through soil compaction and alteration and fragmentation of habitat (Harrison, 1971; Brown, 1990). Sensitive plant species particularly vulnerable to illegal OHV use and cross-country hiking occur in habitats associated with open, gently sloping, gravelly terrain including Lassics' sandwort (Minuartia decumbens T.W. Nelson & J..P. Nelson) and Lassics' lupine (Lupinus constancei T.W. Nelson & J..P. Nelson) (Wunner, 1991).

In regards to exotic seed introduction, cattle, pack animals, and even humans recreating in an area can be vectors for exotic seed (Hoover, 1989).

All uses can affect the plant habitats associated with Port-Orford-cedar by introducing the root disease, Phytophthora lateralis. The presence of Port-Orford-cedar communities is correlated with wet environments which support sensitive plant species as well as other rare taxa.

Concentrations of cattle grazing in meadows and bogs and along streamsides can dramatically affect sensitive species associated with wet areas, namely Benson's saxifrage and clustered green gentian (Frasera umquaensis Peck & Appleg.) directly through grazing, physical impact, and soil compaction, and indirectly as a vector of exotic seed (Wunner, 1991; US Environmental Protection Agency, 1991).

Opportunities

The Forest plans to develop species management guides for the remaining sensitive species, species groups, or sensitive habitats. Priority species for guide development will be those which have the potential to be impacted by management activities, species under review by USFWS for future listing, and species whose range is exclusively within the Forest. The schedule for management guide development is listed in Table V-1 in the Forest Plan. Plans related to McDonald's rock-cress

are pending the results of current research investigating the taxonomy of the species and USFWS review.

Development of management guides depends in part on the urgency, the funding, and the amount of prerequisite work needed (for example, field surveys). Management guides will likely be "habitat-centered," such as a management guide for serpentine endemics, instead of "species-centered." Management guides planned for are identified in Plan Chapter 5. Whenever possible and appropriate, management guides will be developed cooperatively between the Forest and other agencies which share sensitive species. If funding is lacking to develop a comprehensive guide, interim management direction will be developed.

A major emphasis of the threatened, endangered, and sensitive plant and botany program over the next few years is to update the inventory and to inventory habitats with the potential for supporting rare taxa. A relational database (proposed as a Regional database) is being developed to store information about sensitive species and other botanical resources and map the location of sensitive plant populations and plant communities, track sites which are monitored, track areas which have been surveyed, store detailed information on sensitive plant populations and their habitats, and allow for efficient retrieval of information and analysis of data. The database will also facilitate updating information on new sensitive plant locations and monitoring results. The database will be designed in such a way that information can be readily transferred to the California Natural Diversity Database-the central database for natural diversity state-wide.

Monitoring plans will be designed in association with or prior to the development of species/habitat management guides. Monitoring will occur on three different levels which vary in terms of the monitoring questions that need to be answered. Fundamental monitoring needs focus upon gathering baseline information; for example, population and distribution estimates. Inventory, which involves validating documented occurrences, will serve as a level of monitoring for some of the species. See the "Monitoring" section in Chapter 5 of the Plan for more details on the monitoring strategy and funding.

Cooperative efforts to study, preserve, and enhance sensitive plant species and their habitats have been established between the Forest Service and other organizations. The Regional Forester has developed a memorandum of understanding (MOU) with the California Native Plant Society (CNPS), The Nature Conservancy (TNC), The California Diversity Data Base, Rancho Santa Ana Botanic Garden, and the Garden Club of America (GCA). Surveys and inventories, the development of species management guides and monitoring plans, or genetic variability studies are examples of cooperative opportunities available under the MOUs. In the last few years, a field investigation of one sensitive plant species, the two-flowered pea (Lathyrus biflorus), was conducted by CNPS.

Coordination with other Forests and federal and private agencies and agreements with private landowners are used to more efficiently protect populations of sensitive species throughout their range. For example, in order to protect all the known locations of Benson's saxifrage in California, The Nature Conservancy secured a stewardship agreement between the Forest and private landowners. Also, as a result of the two-flowered pea study mentioned above, which identified potential threats, the Conservancy has been requested to facilitate landowner contact.

In addition to these cooperative efforts the Forest can pursue land exchanges that support rare plant species or special habitats i.e. the parcel supporting the Stony Creek bog on the Smith River NRA.

Affected Environment in Context with Alternatives

A majority of the sensitive species are associated with ultramafic substrates or are located within botanical areas (see the “Special Interest Areas” section). For example, of the 19 sensitive plants known to occur on the Forest, 9 are within the boundaries of the North Fork of the Smith Botanical Area alone, and many are exclusive to the area. The Lassics Botanical Area supports a majority of the Lassics lupine, Lassics sandwort, and scabrid raillardella (Raillardella scabrida) populations known to the Forest. Management activities within these areas are restricted to those identified as appropriate by the respective botanical area’s management prescriptions. Land allocation, such as a designated botanical area, is a means by which the Forest protects unique concentrations of sensitive plants and plant communities.

Timber harvesting, road building, mining, grazing, and recreation development are all potential land-disturbing activities that can affect sensitive and endangered plants and their habitat. Implementation of any of these activities would require a site specific analysis to ensure that actions do not jeopardize the existence of these species. Biological evaluations are submitted based upon database review, airphoto study, and field review of the project area. In the event the objective of the activity is in conflict with sensitive plant locations, appropriate mitigation measures are implemented. Avoidance is the most common mitigation. Occasionally, providing maximum protection to a sensitive plant through avoidance is not an option. In such cases, measures to reduce adverse impacts to sensitive plants are employed and their effectiveness is monitored (see “Monitoring” section). Activities such as grazing and vehicular access are ongoing. Where identified as a resource problem, grazing impacts can be mitigated in part by fencing, identification of alternative water sources or other range management practices. This requires coordination between the Forest Range Conservationist, Forest Botanist, and the permittee. Managing vehicular access to areas that are currently uninfected with Port-Orford-cedar root disease will take considerable education of the publics which utilize these roads, coordination with the County (county roads cross sensitive plant habitat), and full commitment from the Forest to implement and maintain protective measures.

Management strategies for the protection of sensitive plants and their habitats do not vary among the proposed management alternatives. The effects of these alternatives on sensitive plants are not analyzed further in Chapter 4.

WILDLIFE

Public Issues

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

Issue 10 How will Forest Plan allocations and their respective management prescriptions affect wildlife?

Issue 11 How should wildlife habitats on the Forest be managed?

Issue 12 How has the ecological corridor concept been treated on the Forest?

Introduction

This section discusses wildlife species that are of special interest or concern to our diverse publics and identifies selected management indicator species that will be monitored to evaluate the effects of our management activities. The section discusses species in the following categories: threatened and endangered species; candidates for Federal listing; Forest Service sensitive species; State listed species and species of special concern; harvest species; and management indicator species. Some species are discussed in more than one grouping; this is because they are listed under more than one state or federal category and/or they have been chosen as management indicator species.

Management responsibilities for wildlife on the Forest are shared between the Forest Service, California Department of Fish and Game, and U.S. Fish and Wildlife Service (for threatened, endangered, and candidate species). All wildlife legally belongs to the State, which manages individual animal species and populations. The Forest Service is responsible for maintaining suitable habitat that will support well distributed, viable populations of wildlife. The USFWS, as authorized under the Endangered Species Act of 1973, as amended, is responsible for the protection and recovery of Federally listed plant and animal species.

Current Situation

The Forest provides habitat for 298 known species of terrestrial wildlife (76 mammals, 185 birds, 37 reptiles and amphibians), with 48 species classified as game animals or furbearers. Sixty-six of these species (22 percent) have been identified as Emphasis species and will be the primary focus of the wildlife management program. These species are discussed in detail below; the information is summarized in the Forest Plan.

Threatened and Endangered Species:

Federally-listed threatened and endangered species receive special management attention from the Forest as directed by the Endangered Species Act. The Forest consulted with the USFWS and received a list of proposed, threatened and endangered, and candidate species likely to occur on the Six Rivers National Forest from USFWS on July 13, 1994 (Case No. 1-1-94-SP-1339; See Appendix D of the accompanying Plan). The Forest continues to consult, both formally and informally, on all federally-listed species that may be affected by specific programs and projects.

Bald eagle and peregrine falcon are classified as endangered and are managed in accordance with their recovery plans (USFWS, 1986 and 1982, respectively). Region 5 of the Forest Service allocated recovery plan population goals for the peregrine falcon and bald eagle to each National Forest in the recovery area as its respective contribution toward status change (reclassification to threatened) or delisting (species recovery and removal from Federal listing). Region 5 planning direction would protect all occupied sites at high or moderate habitat capability levels. Threatened species that occur on the Forest are the northern spotted owl and the marbled murrelet, which was

recently given threatened status. As neither the owl nor the murrelet has an approved recovery plan yet, the Forest works in consultation with the USFWS to ensure that management activities will not jeopardize these species or their critical habitat.

Bald eagle: Bald eagles nest near lakes and rivers in large (greater than 36 inches in diameter), old trees, in open, uneven-aged mature/old-growth forests. They feed primarily on warm-water fish in the summer, salmon and carrion in the winter. They typically roost in groups of several individuals. Most of the forested land within one quarter mile of the major rivers is potentially suitable bald eagle habitat. Extensive habitat inventories have not been conducted, but sighting records and annual surveys indicate only a small portion (less than 10 percent) of the habitat is presently occupied. Prey availability is strongly influenced by the form and structure of the river channel and species of fish present, and many areas may not be productive enough to support a breeding pair of eagles.

The Pacific Bald Eagle Recovery plan (USFWS, 1986) lists the Klamath, Trinity, and Eel rivers and Ruth Reservoir/Mad River as key habitat areas. Historically, these birds have nested along the Klamath, Trinity, and Mad rivers. There are presently four known bald eagle territories, several suspected nest territories, and a small wintering population on the Forest. Sighting reports are collected, and occupied nest sites are examined on an annual basis. The bald eagle has recently been proposed for reclassification from endangered to threatened status (USFWS Fed. Reg. Vol. 59, No. 132, 35584-35585), which reflects the bird's progress toward recovery.

The Region assigned the Forest the bald eagle recovery goals of providing habitat to support four breeding territories and two wintering areas. The Forest has delineated over 9,000 acres of suitable nesting and wintering habitat for bald eagles. Management of these areas is governed by the Recovery plan in consultation with the USFWS.

This species has an inestimable value as America's national bird apart from its intrinsic worth.

Peregrine falcon: Peregrine falcons nest on cliffs, feed primarily on birds, and prefer foraging in riparian forest habitat along lakes and rivers. There were over 100 documented sightings of peregrine falcons on the Forest between 1975 and 1992. Approximately 22 sites on the Forest are considered to have potentially suitable peregrine falcon habitat, and extensive habitat surveys have been conducted Forest-wide in cooperation with the USFWS and the Bureau of Land Management (BLM). Twelve cliffs have been assessed and six enhanced or improved to encourage peregrine falcon nesting. Nine pairs of peregrine falcons are suspected to nest on the Forest; only four or five pairs successfully fledged young annually. An average of 65 percent successfully reproduce in the north interior recovery zone during any year. An addendum to the Pacific and Rocky Mountain and Southwest recovery plans are being prepared that will propose reclassification of the peregrine falcon where subpopulations meet the downlisting goals in the respective recovery areas.

The Regional Planning Handbook assigned the Forest a peregrine falcon population recovery goal of 7 breeding pairs. The habitat management allocation for the falcon considered California occupancy and reproductive success rates and was determined to provide sufficient suitable habitat to achieve the population recovery goal. The Forest recovery objectives for the peregrine falcon will provide

sufficient suitable habitat (up to 17 falcon habitat areas) to maintain 7 breeding pairs within 2 recovery zones. This is based on the current state averages for occupation rates and reproductive rates of this species. Primary and secondary disturbance zones have been delineated around nest site protection zones, in which loud and continuous activities are restricted during the breeding season. The Forest has delineated over 25,000 acres of suitable and potentially suitable nesting habitat for the peregrine falcon. Management of these areas is consistent with the recovery plan, and in consultation with the USFWS.

The Forest has monitored most active sites annually, in cooperation with USFWS, BLM, and CDF&G. Inaccessible sites are monitored by helicopter on an occasional basis, when funds and experienced observers are available. Some nesting sites continue to experience failure or declines in reproduction, probably the result of eggshell thinning, which has been discovered at several sites on the forest. Eggshell thinning is caused by the gradual accumulation of DDT and related chemicals and their corresponding effect on physiological pathways.

Northern spotted owl: The spotted owl prefers multi-layered mature and overmature Douglas-fir forests. Dense forest stands, with their associated snags and large down log habitat components, provide the primary nesting and foraging habitat requirements to ensure reproductively successful spotted owl pairs (Forsman, 1976; Marcot, 1979; Sisco and Gutierrez, 1984; Solis, 1983). The dusky footed woodrat is the primary prey species for the spotted owl in northwestern California.

The northern spotted owl was listed as threatened with extinction by the U.S. Fish and Wildlife Service on June 23, 1990 (Fed. Reg. Vol. 55, No. 123, 26114-26139). As required by the ESA, the USFWS listed the final Determination of Critical habitat for the Northern Spotted Owl in the Federal Register (Fed. Reg. Vol. 57, No. 10, 1796-1838).

In May of 1990 an Interagency Scientific Committee (ISC) proposed “A Conservation Strategy for the Northern Spotted Owl” (Thomas et al., 1990). The Forest Service (FS) issued a notice on October 3, 1990, (Fed. Reg. Vol. 55, No. 192, 40412-40414) which vacated their previous spotted owl management guidelines and established the agency’s intent to conduct future timber operations in a manner not inconsistent with the ISC Plan. On May 23, 1991, the U.S. Western District Court in Washington (Seattle) found that the Chief’s actions to vacate the SEIS ROD and to issue direction that timber sales not be inconsistent with the ISC report violates the statutory obligations under NFMA (National Forest Management Act), which incorporates NEPA (National Environmental Policy Act) requirements. The Forest Service issued the Final Environmental Impact Statement on the Management of the Northern Spotted Owl in the National Forests (NSO EIS), which included the ISC Plan as the preferred alternative, in January 1992. On July 2, 1992, Judge William Dwyer deemed the NSO EIS to be inadequate to provide for viability of the northern spotted owl. He issued a second injunction enjoining the Forest Service from auctioning or awarding any timber sales in Regions 5 and 6 that would log suitable spotted owl habitat until revised standards and guidelines in compliance with NEPA and NFMA are adopted and in effect. The Forest Service prepared a supplemental EIS (SEIS) that incorporated planning to assure viability of other species that use the same habitat as the northern spotted owl. The Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (FSEIS) was released in February, 1994, and the Record of Decision for Amendments to Forest Service and Bureau of Land Management

Planning Documents within the Range of the Northern Spotted Owl (ROD) became effective May 20, 1994.

The Forest is currently maintaining large reserves of late successional coniferous forest habitat (that includes up to 76 percent of the suitable owl habitat), most designated critical habitat, and protects up to 100 acres of the most suitable habitat associated with spotted owl activity centers that occur outside the reserves. The Forest also provides suitable dispersal habitat for movement between the large reserves. Current direction also requires that the Forest Service consult with the USFWS on all activities within critical habitat, or activities that would result in incidental take of a spotted owl. In recent years the Forest has informally and formally consulted with USFWS on projects within suitable northern spotted owl habitat. The Forest Service also is maintaining designated critical habitat and is complying with the reasonable and prudent measures and Conservation recommendations that the USFWS identified in its current Biological Opinions (available in the planning records).

The Department of Interior, which oversees the USFWS, established a Recovery Team for the northern spotted owl in February, 1991. The recovery team evaluated critical habitat, the ISC Plan, and all other pertinent information. The Final draft Recovery plan for the northern spotted owl was nearly completed in December, 1993, but not released pending completion of the FSEIS and ROD. The Final Recovery plan for the northern spotted owl is expected be finalized in 1995, following the issuance of proposed regulations under Section 4(d) of ESA that address northern spotted owl habitat on non-federal lands (K. Sanchez, personal communication, 1994).

The 100-acre habitat areas at activity centers protect about the same number of owl pairs and territorial singles (93) that were protected by the Category 4 (Habitat Conservation Areas), from the ISC Plan (1990). The draft Recovery plan and designated Critical habitat for the owl are expected to be modified to reflect the changes made by the interagency team in the FSEIS ROD.

Two hundred thirty-two known pairs of spotted owls and 46 territorial singles occur on the Forest, with a floating population of over 56 single owls. There are 8 large late successional forest reserves on the Forest, which range from 321,000 acres to over 342,000 acres and connect with Congressionally reserved lands such as wilderness, the Smith River National Recreation Area, and wild rivers. Critical habitat outside these reserves consists of an additional 25,525 acres. The large reserves currently provide habitat protection for 101 to 139 owl pairs. The Forest also protects over 90 activity centers which cover approximately 9,500 acres and will maintain activity centers for these owl pairs or territorial singles. Some of these retention areas may not be occupied at this time, and some have not been surveyed in over five years.

The Forest Service defines suitable spotted owl habitat as being composed of mature stands having multi-layered conditions, a canopy closure of 70 percent or greater, and obvious decadence (large, live coniferous trees with deformities, such as cavities, broken tops, and dwarf-mistletoe infections). The overstory should contain trees 21 inches or greater diameter at breast height (dbh) and should comprise at least 40 percent of the total canopy closure. This Forest also considers suitable stands to be those with overstory canopy closures of 40 percent or less. These stands typically have a hardwood understory which increases the total canopy closure to 60 percent or greater. Suitable habitat should contain numerous large snags, ground cover characterized by large accumulations of

logs and other woody debris, and a canopy open enough to allow owls to fly within and beneath it (Thomas, 1990).

The Forest FORPLAN model used a baseline of 365,690 acres of suitable habitat on the Forest. The Forest database indicates that there are currently 275,449 acres of high or moderate quality spotted owl habitat in seral stages 4A and 4B/C1/ in the Kuchler mixed evergreen/chinquapin or rhododendron vegetation type. Of these acres, from 117,613 (43 percent) to 151,750 (55 percent) are located inside the large reserves and from 157,886 (57 percent) to 43,850 (16 percent) are located outside reserves in the Adaptive Management Area (AMA) and matrix. An undetermined number of suitable acres also is expected to exist in other atypical habitat strata, such as Klamath and Coast Range montane (true fir) vegetation types. Approximately 59,400 acres of potentially suitable habitat occur in these mixed conifer/true fir types, of which over 51,000 acres (85 percent) are located within reserves and only 4,700 (8 percent) may occur outside of the reserves.

Marbled murrelet: In North America, marbled murrelets range from Alaska south to central California, typically feeding in ocean waters within 1 mile of shore (Marshall, 1988). Murrelets nest from southeast Alaska to central California in mixed stands of mature and old-growth coniferous forests within 50 miles of ocean waters (Carter and Sealy, 1986). Murrelet nests have been found in mature and old-growth stands containing Douglas-fir, coast redwood, western red cedar, mountain hemlock, Sitka spruce, and western hemlock (Binford et al., 1975; Quinlan and Hughes, 1990; Hamer and Cummins, 1991; Singer et al., 1991, 1992; Nelson et al., in press; Nelson et al., in preparation).

Most of the known marbled murrelet population in California occurs in State and Federal parks or on private timberlands in close proximity to the coast. Murrelets were observed at 7 locations on the Gasquet Ranger District as part of studies by Paton and Ralph in 1988 and 1989 (Paton and Ralph, 1988, 1990). The Forest completed surveys using the regionally approved protocol in selected sale areas during the summer of 1992. Three sightings were confirmed in 1992; two sightings of occupied bahavior at approximately 18 miles inland, and one fledgling found on the ground appriximately 16 miles inland. No murrelets have been detected by surveys on the Forest in either 1993 or 1994.

The marbled murrelet was listed as a threatened species in Washington, Oregon, and California by USFWS on September 28, 1992. Critical habitat was proposed (Fed.Reg. Vol. 59, No. 18, 3811-3823 (Jan. 27, 1994)), and the draft recovery plan is expected to be released in 1995. The USFWS has determined that the management strategy for the northern spotted owl adopted by the Forest Service would provide some protection for the marbled murrelet, but would not adequately provide protection for murrelet nesting habitat. The FSEIS ROD established two marbled murrelet zones: Marbled Murrelet Zone 1, the near zone, includes lands from the coast to 35 miles inland at the northern Forest boundary (California/Oregon border) and varies southward to include lands from the coast to 25 miles inland in the central part of the Forest; Zone 2, the far zone, includes lands from the boundary of Zone 1 to a line 50 miles inland from the coast. Refer to the map of “Federal Land Allocations Proposed under Alternative 9” accompanying the FSEIS. The Forest Service has included additional suitable habitat that occurs within Zone 1 in the large reserves (FSEIS ROD). The Forest Service has consulted with the USFWS, under the Endangered Species Act, on actions that may affect the marbled murrelet or its habitat, and continues to work in consultation with the USFWS to identify essential habitat and protection measures necessary to ensure the Forest

contribution to the recovery of the murrelet. The Forest has delineated protection buffers of suitable habitat, consistent with direction in the FSEIS ROD, at the two occupied sites identified above and at the Yurok Experimantal Forest. All currently known sites occur on reserved lands. All proposed critical habitat on the Forest occurs in LSRs, and does not include the Old-Growth 1 and 2 additions in the Near Zone.

For the Six Rivers National Forest, we consider all late-successional forest habitat, and a portion of the early mature forest that has a large overstory component, as suitable murrelet nesting habitat. The Forest originally modeled all young, mature, and old-growth forested habitat within 35 miles of the ocean as suitable, but has modified our model to include only some closed canopy young forest stands (67 percent) within the mature and old-growth forested stands for a baseline of 227,700 acres within Marbled Murrelet Zone 1 (Near Zone) which extends inland from the ocean, and ranges from 35 miles inland at the Oregon border, to the Klamath and Trinity rivers, and down to 25 miles inland west of Humboldt Bay (see Figure III-9). Most of the suitable habitat in Zone 1 occurs in LSRs. An additional 115,110 acres of suitable mature habitat occurs in Marbled Murrelet Zone 2 (Far Zone), which includes all lands from the eastern boundary of Zone 1 to a distance of 50 miles from the coast. All of the Forest is in either Zone 1 or Zone 2.

Mature and old-growth habitat with sparse to good canopy cover is potentially suitable for marbled murrelets (Paton and Ralph, 1988; Federal Register Vol. 56, No. 119, 28367; Ralph and Nelson, 1992). On the Six Rivers, this includes seral stages 4A and 4B/C. Some stands(67 percent) of seral stage 3B/C (pole size trees to 21 inches dbh) are considered potentially suitable for murrelets if the stands contain remnant large trees with branches large enough for nesting, or if mistletoe clumps occur, providing nesting opportunities (personal communication, S. Kim Nelson). Generally, the habitat characteristics associated with murrelet nesting are large trees with large lateral branches (6 inches and greater) which provide nesting opportunity, and a mature understory that extends into the canopy of the old-growth, providing protection for potential nest sites. These characteristics usually do not develop until trees are 120 to 175 years old. The majority of murrelet observations to date have been below 2,000 feet elevation, with some detections between 2,000 and 3,000 feet.

Paton and Ralph (1988) found that stands of old-growth trees in California larger than 500 acres were more likely to have more detections and presumably support larger murrelet populations. Nelson (Nelson et al., 1991) found that the average occupied stand size was about 500 acres in Oregon. Stands less than 100 acres lack the qualities and microclimates associated with forest interior (Spies et al., 1990). Birds have been detected in stands less than 100 acres; however, detections were few (Paton and Ralph, 1988). Therefore, management activities which fragment contiguous stands of mature and old-growth trees would be detrimental to murrelet nesting habitat by increasing edge effects. The probability of predation at nest sites and modification of habitat structure through wind-throw would also increase with habitat fragmentation.

Juvenile dispersal capabilities and habitat requirements during dispersal for the marbled murrelet are not well understood. The degree to which continuous forest cover (connectivity) is necessary from the coast to inland nesting sites to ensure successful reproduction is also not well known. Currently, this habitat is highly fragmented due to harvest activity on state and private lands.

Potential predators of marbled murrelet include great horned owl, raven, crow, Stellar’s jay, and peregrine falcon, all known to occur on the Forest. Of the 23 known murrelet nests on the Pacific

coast, 61 percent failed due to predation (1990 and 1991), 2 failed because chicks fell out of the nest, and 2 failed due to human disturbance (Nelson et al., in preparation). It is thought that the position of the nest in the crown may be specific to predator avoidance.

Proposed for Federal listing:

California red-legged frog: The USFWS initiated a status review on subspecies Rana aurora draytonii on October 5, 1992, in their response to a petition to list both the California red-legged frog and the western pond turtle. This subspecies was most likely to occur in the southern portion of the Forest. Their review (Fed. Reg. Vol. 59, No. 22, 4888-4895) proposed R. a. draytonii as endangered, and determined that this subspecies is most likely to occur as an intergrade in the southern portion of the Forest. The rule did not extend the Endangered Species Act's protection to Rana aurora draytonii in Humboldt and Trinity counties; therefore, it is not a protected subspecies in the Forest. The northern red-legged frog R. a. aurora, is likely to occur throughout the Forest, north of the range of subspecies R. a. draytonii and is a candidate (category 2) for Federal listing (Fed. Reg. Vol 59, No. 219, Nov. 15, 1994).

The red-legged frog is associated with shaded ponds and wetlands in coniferous forests. However, they forage extensively throughout the forest during the wet season and may be found in moist areas year round. They are reported to range up to 1,000 feet from standing water during the non-breeding season (H. Welsh, 1991, personal communication). Water temperatures that exceed 70 degrees are reported to be lethal to embryonic frogs. There have been few surveys for this species; however, suitable habitat may be common on the Forest. The Forest has only 5 records of this frog, and the subspecies were not identified.

Candidates for Federal listing:

Del Norte salamander: The Del Norte salamander is a terrestrial salamander closely associated with moist talus or rock rubble areas in coniferous forest. This salamander has restricted mobility over the landscape and appears to have very specific habitat requirements. It is one of the most geographically restricted members of the lungless salamander family, occurring only in northwestern California and southwestern Oregon. This species was identified by the (Forest Ecosystem Management Assessment Team) scientists as needing additional protection.

Surveys conducted by Hartwell Welsh (Pacific Southwest Forest and Range Experiment Station) from 1984 to 1986 found small isolated populations at several locations on the three northern Ranger Districts (Welsh, 1987). His data indicated that Del Norte salamander occurred primarily in mature and old-growth Douglas-fir forests. Additional surveys conducted by Welsh throughout the Klamath province in 1989 showed the majority of captures occurred in talus areas within old-growth coniferous forests (Welsh, 1990). This species is not expected to occur south of the Mad River or east of the Forest boundary. The Forest has 58 records of this salamander from 12 general localities. A subsequent study, in cooperation with California Department of Forestry found the salamander in 15 watersheds on the 3 northern districts.

Foothill yellow-legged frog: This species, Rana boylii, is a recent addition to the candidate species list (USFWS, 1991). The Forest and Pacific Southwest Experiment Station have worked with the Bureau of Reclamation (BOR) on the Trinity River Restoration project to conduct research on this

species in the main stem and south fork of the Trinity River. The yellow-legged frog characteristically occupies larger streams and rivers. The adults are found at the edges of rocky pools formed during the low stages of rivers and streams, and egg laying and subsequent larval development occur in these pools. Earlier research found this species to use a fairly narrow range of water depth, water velocity, and proximity to the shore for their breeding (Fuller and Lind, 1993).

Fisheries surveys have found this frog in many of the larger tributaries in the Smith River watershed and in the Trinity River. This frog is reported to be doing well in the north coast area (M. Jennings, 1993).

Northwestern pond turtle: The USFWS initiated a status review on both subspecies of the western pond turtle (Clemmys marmorata marmorata and C. m. pallida), on October 5, 1992, in their response to a petition to list both the turtle and the California red-legged frog. The northwestern pond turtle, subspecies C. m. (marmorata) is likely to occur Forestwide. The Forest has started to conduct surveys for this species. It is reported to occur along most rivers and many of the ponds; suitable habitat associated with rivers, creeks, ponds, and wetlands is common throughout the Forest. The northwestern pond turtle has been designated a Forest Service sensitive Species in Region 5 (1993) and is addressed in more detail in the following section.

Northern goshawk: A coalition of conservation organizations had petitioned the USFWS to list the northern goshawk as threatened in the “forest west” (west of 100th meridian). The Service determined that the petitioned action was not warranted, classified the goshawk as a Category 2 candidate species (56 FR 58804), and initiated a status review in January, 1992. The northern goshawk (Accipiter gentilis atricapillus) occurs in montane forests throughout northern North America and the western United States. A number of studies have reported declining goshawk populations and questioned the adequacy of current forest management strategies for ensuring the survival of existing populations (Hall 1994) .

The Forest Service in the Southwest Region established a Goshawk Scientific Committee which worked with a regional task force to develop management guidelines for the goshawk in Arizona and New Mexico. This scientific committee is currently reviewing goshawk research throughout the west to develop consistent management guidelines for other Regions that consider it a sensitive species. The northern goshawk was designated a Forest Service sensitive species in the Pacific Southwest Region in 1976 and is addressed in more detail in the following section.

California wolverine: The wolverine uses a variety of habitats and appears to prefer large undisturbed areas. Its preferred habitat is reported to occur at high elevations (generally around timberline). Talus fields and large deadfalls are used for denning (White and Barrett, 1979). These authors believe the survival of wolverine in California is dependent on access to mature conifer forest habitat, especially in the winter, for carrion and abundant prey. Eleven wolverine sightings were reported on the Forest during the 1980s, and nearly 50 sightings were reported prior to 1980. The majority of sightings were in the vicinity of the Siskiyou and Trinity Alps wildernesses.

Pacific fisher: The USFWS was petitioned on June 5, 1990, to list the Pacific fisher as threatened in the Klamath Province of California and endangered in Washington, Oregon, and the Sierra Nevada province of California (representing the range of the Pacific fisher). It was determined that there was insufficient scientific information available to determine if protection under the Endangered

Species Act was justified ("Petition finding for the Pacific fisher," letter dated September 27, 1990). The petition to list was concluded to be unwarranted at this time by the USFWS; however, the Pacific fisher was classified as a Category 2 candidate species. The Pacific fisher was designated a Forest Service sensitive species in 1986 and is addressed in more detail in the following section. There are 248 records of the fisher on the forest.

Pacific western big-eared bat: The big-eared bat feeds in a variety of habitats, but depends on caves and abandoned mines and buildings for colonial breeding and roosting areas (Williams, 1986). Recent surveys conducted by the state found them occupying a mine shaft on the Orleans Ranger District, and biologists have reported them using a cave on the Mad River Ranger District and rock crevices on Lower Trinity Ranger District. The Forest Service has published a final rule on Cave Resource Management (Fed. Reg. Vol. 59, No.116, 31146-31154, June 17, 1994), which establishes criteria nominating, evaluating, and designating significant caves. These criteria include the use by sensitive bats.

White-footed vole: The white footed vole is extremely rare (only three records in northern California) and is associated with forest riparian habitat along small coastal streams. There are no records of this species on the Forest; however, suitable habitat may exist (Williams, 1986).

Karok Indian snail: The Karok Indian snail (Vespericola karokorum) has recently been verified by Roth and Miller (in press, 1995) as a distinct species. This snail is found in riparian zones centered within small tributaries of the Klamath River on the Orleans Ranger District. The range of the snail is very limited, but the precise distribution is undefined. No recent surveys to determine abundance have been done. There are 18 records of this snail from 15 general locations (Hunt 1990).

Other invertebrates: The Siskiyou and Trinity Alps ground beetles and the Klamath bumble bee are recent recommendations to the USFWS for inclusion on the candidate species list, and while there are no records of these species occurring within the Forest, suitable habitat may exist.

Forest Service Sensitive Species:

These animal species were identified by the Regional Forester because of concerns for the viability of their populations. There is evidence that they are experiencing or are predicted to experience significant downward trends in population numbers, density, and/or habitat quantity and quality. The goal of habitat management for sensitive species is to prevent these animals from becoming candidates for threatened or endangered status. The Threatened, Endangered, and Sensitive Species Action Plan (USDA, 1992), for the Pacific Southwest Region, provides direction for the Region to develop "Conservation Strategies" that would protect these species and their essential habitat and preclude the need for federal listing.

American marten: The status of marten populations on the Forest is not known. It is considered a rare species. Two subspecies are expected to occur on the forest. Martes americana humboldtensis is associated with redwood forests, which are very limited on the Forest, and appears to be extremely rare. The other subspecies, M. a. sierrae, is widespread and is found at higher elevations in true fir vegetation types (white and red fir) in the Klamath Province and Sierra Nevada Range.

A preliminary study, based on historic records through the mid 1970s, suggested that marten was uncommon but was believed to be increasing in the North Coast mountains (Schempf, 1977). Marten research in California has been conducted only in the central Sierra Nevada range (Simon, 1980; Hargis, 1982; Martin, 1987). These researchers found that a marten reproductive unit (a single male overlapping two female territories) has an average home range of approximately 2,100

acres of moderately capable habitat. Only the Siskiyou and Trinity Alps Wildernesses and their associated reserved lands contain sufficient suitable habitat to support small subpopulations of marten. However, martens are likely to occur in isolated areas outside of Wilderness. There are 46 records of marten from 38 general locations on the Forest.

Marten prefer multi-storied mature and overmature mixed conifer (white fir/red fir) forests with moderate to dense canopy closure. They are most abundant in forested areas adjacent to meadows or riparian corridors. They require travelways comprised of closed canopy forests to move between foraging areas (Freel, 1992). These forest conditions are limited on the Forest to several major mountain ranges and along ridgelines, generally above 4,000 feet elevation. Moderate and high quality habitats contain 2 to 3 large snags and 10 to 20 large logs per acre, habitat elements which are important for denning and resting. Habitat requirements and use vary by gender of the animal, season, habitat quality, prey availability, and other factors.

Comprehensive surveys have not been conducted on the Forest for either subspecies, and the existing population is unknown. The Forest is participating in a multi-agency forest carnivore survey project, which is conducting surveys from the coast, inland through the Forest, along road transects. The Forest has also worked with a scientist from the Redwood Sciences Laboratory, Arcata, to test survey and monitoring strategies for the marten and fisher in the Pilot Creek watershed on the Mad River district. Suitable habitat occurs as large blocks in the Siskiyou and Trinity Alps Wildernesses and is generally naturally fragmented along several major ridges throughout the rest of the Forest. An estimated 63,000 acres of moderate or high quality marten habitat occur on the Forest in seral stages 4A, 4B/C, and older 3B/C in the Klamath and Coast Range montane Kuchler vegetation types (this includes mature redwood). However, these figures do not account for spatial distribution and fragmentation (both natural and man-induced). An undetermined amount of low quality habitat is also expected to be used by martens, as areas of less desirable seral stages and vegetation types that occur adjacent to higher quality habitat.

M. a. sierra is known to occur on the Forest because of localized surveys, various research projects, and incidental sightings. There are no recent sighting records for the M. a. humboldtensis subspecies in the redwood areas of the Forest. An assessment of habitat capability (based on sighting records, suitable habitat requirements, and territorial behavior of marten) suggests the Forest has sufficient habitat to support up to 42 reproductive units. Reserved areas, such as Wilderness, and large reserves currently provide sufficient habitat for up to 37 reproductive units on an estimated 53,500 acres.

Pacific fisher: Moderate and high quality fisher habitat is similar to that preferred by the spotted owl and marten. Fisher occupy multi-storied mature and overmature conifer forests with moderate to dense canopy closure and scattered patches with six to eight large snags per acre and abundant down logs (Buck et al., 1983). This predator forages primarily in dead wood; therefore, both standing snag and down log densities are important indicators of habitat quality. They use traditional travelways along ridges and streams comprised of closed canopy forests when they move between moderate to high quality habitat areas (Buck, 1989, personal communication).

Comprehensive surveys for fisher have not been conducted on the Forest, and the abundance and distribution of fisher populations on the Forest are unknown. The only Pacific fisher research in California was conducted on the neighboring Shasta-Trinity National Forest (Buck, 1983). The

Forest initiated a fisher/marten study with William Zielinski, Region 5 Forest Carnivore Scientist, to test the survey and monitoring strategies and develop silvicultural prescriptions to improve or maintain moderate quality habitat. Additional studies have been initiated on private timberlands in California (Self and Kearns, 1992). The CDF&G Furbearer Survey (Schempf, 1977) conducted in northwestern California concluded the fisher was common and believed their population was increasing.

Moderate and high quality fisher habitat on the Forest occurs in mid-elevation Douglas-fir forests in the mixed evergreen with chinquapin and rhododendron vegetation type, in addition to higher elevation habitats in the Klamath and Coast Range montane vegetation types. Habitat requirements for the fisher appear to be similar to those of the spotted owl. The Forest database indicates that there are currently an estimated 410,000 acres of moderate or high quality fisher habitat in seral stages 4A, 4B/C, and 3B/C in the mixed evergreen with chinquapin or rhododendron vegetation type. Management-induced fragmentation and habitat alteration are believed to have greatly reduced the amount of moderate and high quality habitat on the Forest since 1975.

The home range of a fisher reproductive unit (one male overlapping two female territories) in northern California averages about 9,800 acres of suitable habitat (Buck, 1983; Freel, 1992). Home range size can be highly variable in response to habitat quality, season, competition with other predatory species, and other factors. The Forest has an estimated (based on sighting records, habitat requirements, and behavior) potential habitat capability to support up to 35 reproductive units (1 male and 2 females) in the mixed evergreen forest type, and an additional 9 units within higher elevation Klamath and Coast Range montane forest types (which is considered suitable marten habitat). Reserved areas have the potential to support up to 14 reproductive units. The Six Rivers portions of the Siskiyou and Trinity Alps Wildernesses alone could support up to 3 reproductive units, and the large reserves on the Forest could support up to 13 reproductive units.

Northern goshawk: Northern goshawk is uncommon on the Forest. Goshawk in northern California use older pole-sized and mature conifer forests with relatively dense canopy closures, usually little understory vegetation, close proximity to riparian corridors, and flat or moderately sloping terrain. Moderate and high quality habitats contain abundant large snags and large logs for prey habitat and plucking perches (Hall, 1984). The goshawk is predatory, dependent on both avian and mammalian prey, and is generally non-migratory or disperses for short distances.

Comprehensive surveys for goshawk have not been conducted on the Forest, but they appear to occur Forest-wide. The Forest, in cooperation with the Klamath Naional Forest and the Regional Office, is monitoring historic nest sites to determine occupancy. Forest records identify 25 historic territories (based on nest sites or young goshawk), and 5 suspected territories based on multiple sightings. Seventy-five percent of the known nest sites occur in the southern portion of the forest, but the goshawk's distribution within the multi-layer mixed evergreen forest type is not well known. An estimated 477,000 acres of moderate or high quality habitat occurs on the Forest in seral stages 4A, 4B/C, and 3B/C in the mixed evergreen with chinquapin or rhododendron and Klamath montane vegetation types. Single storied forest stands with sparse understory, the preferred habitat for nesting, may be more limiting than the acreage shown above would suggest. Decades of fire control have favored multi-layered conditions over much of the forest. An assessment of habitat capability (based on sighting records, habitat requirements, and behavior of goshawk) indicates the Forest could support up to 75 pairs. Reserved areas alone could potentially support up to 42 territories.

Goshawk research was conducted on the Forest (Hall, 1984) and on the adjacent Klamath National Forest (Woodbridge, 1988). CDF&G recommended the protection of 120 acres of suitable habitat for goshawk nest territories (Bloom et al., 1986). Woodbridge (1988) found that northern goshawk territories with 161 to 200 acres of moderate to high quality habitat were occupied 96 percent of the time, whereas stands of less than 40 acres were only occupied 15 percent of the time. Woodbridge's findings are comparable to the "nest areas" described in the USFS Southwest Region's Northern Goshawk Management Guidelines (Fed. Reg. Vol. 57, No. 119, 27424-27435). The goshawk scientific committee also recommended establishing post-fledgling family areas (PFA) of 420 acres, which corresponds to the territory or defended area and represents the area of concentrated use by the family after the young have left the nest; and foraging areas of 5,400 acres that maintain specific levels of mid-aged, mature, and old forest conditions to ensure that adequate prey populations occur over time. These areas also have guidelines to eliminate disturbance and limit management activities, particularly within the nest areas and PFA.

Regional guidelines (USFS, 1984) specified that Forests would manage for at least 2 breeding territories per township and that each territory must have at least 50 acres of suitable habitat. The Forest has currently designated 55 goshawk habitat areas that meet the Regional guidelines. This network approach parallels the (Spotted Owl Habitat Area) strategy originally developed for the spotted owl; it does not reflect the large reserves established for the spotted owl or other late-successional speices. Most of the 55 goshawk areas occur in wilderness or on reserved lands. The Goshawk Scientific Committee is currently developing management guidelines that are applicable to other areas in the west and yet consistent throughout its range.

Great gray owl: Great gray owl is associated with mature and overmature mixed conifer forests, adjacent to large meadow complexes, and is reported to be dependent on voles as prey (Winters, 1980). While comprehensive surveys for the great gray owl have not been conducted on the Forest, there are single records from both Del Norte and Humboldt counties. Moderate and high quality habitat conditions, particularly the occurrence of large meadow complexes, are limited on the Forest (Winters, 1980), and occirs primarily on reserved lands. While Winters estimated that there was potentially suitable habitat to support 13 pairs, the limited numbers of large meadows within suitable habitat reduced his estimated potential population size for the Forest to two pairs. The FSEIS ROD would establish protection buffers for occupied habitat that would be managed as Late-Successional Reserves.

Willow flycatcher: Willow flycatchers occupy relatively large wet meadows adjacent to large streams, and prefer to nest in large clumps of willows separated by openings (Marcot, 1979). Comprehensive surveys for willow flycatchers have not been conducted on the Forest, and sighting records are few (30 since 1990), suggesting only transient (vagrant) use in the early spring and again during late summer. Recent riparian studies along the Trinity River within the Shasta/Trinity National Forest located three territories along the main stem of the Trinity River, generally at the confluence of major tributaries. Similar potentially suitable habitat occurs on the Forest within the wild, scenic, and recreational river corridors. Riparian studies (S.Sniado, personal communication, 1994) along the Klamath River have detected the willow flycatcher with young, generally after the breeding season; active nesting territories have not been discovered. This study will be extended into the lower Trinity River system.

Northwestern pond turtle: This subspecies of the western pond turtle (Clemmys marmorata marmorata was designated as a sensitive species in the Pacific Southwest Region (2670 letter dated June 1, 1993), and is likely to occur Forestwide. The western pond turtle is a habitat generalist, and it inhabits a wide range of permanent and intermittent fresh water bodies from sea level to about 4,500 feet elevation. All known nest sites occur in non-riparian habitats adjacent to the watercourses the turtles inhabit. They have low productivity; survivorship in hatchling and juvenile turtles is low, changing to high survivorship in adults, with a potentially long life span. They feed primarily on aquatic invertebrates.

The Forest has coordinated with the Pacific Southwest Experiment station and the BOR, in the Trinity River Restoration program, to conduct research on the turtle in the Trinity River basin. This research on the ecology of the western pond turtle will help the Forest determine how to manage this species. The Forest has conducted lake surveys, and several districts have started surveys for this species. It is reported to occur along most rivers and many of the ponds; suitable habitat associated with rivers, creeks, ponds, and wetlands is common throughout the Forest.

Summer steelhead trout and spring chinook salmon: See the Fisheries section of this chapter for life history background on these species.

State Listed Species and Species of Special Concern:

The Forest recognizes an additional classification of species as having special status. These are species listed as threatened or endangered within the state and state “species of special concern,” a designation assigned by CDF&G to species with populations considered to be declining or in jeopardy of extinction. State listed species may also be listed as federally threatened or endangered or as Forest Service sensitive. Those species are discussed in previous sections of this chapter. Species of special concern known or having the potential to occur on the Forest include the osprey, sharp-shinned hawk, long-eared owl, merlin, purple martin, yellow warbler, yellow-breasted chat, prairie falcon, golden eagle, great blue heron, American badger, and red tree vole (Williams, 1986).

Osprey: Osprey occur in the vicinity of large rivers, lakes, and reservoirs. They generally nest at the top of large snags overlooking water (Marcot, 1979). The Forest has over 15 known osprey territories; 4 nests are located near lakes and reservoirs, 11 along major rivers. All osprey nest trees are protected. Several platforms were constructed in unoccupied areas in the past to encourage nesting activity.

Golden eagle: Golden eagles occur in open woodlands and hardwood savannahs and grasslands. They nest in trees or on cliff ledges (Marcot, 1979). The Forest has never located any golden eagle nests; however, territories are suspected to occur in the southern part of the Forest. All golden eagle nest trees would be protected.

Sharp-shinned hawk: Sharp-shinned hawks occur in forested stands with high tree densities, closed canopies, and sub-mature age classes (Marcot, 1979). The sharp-shinned hawk is uncommon on the Forest, and its population trends are not known. Nest trees would not be disturbed until the young fledge.

Great blue heron: Great blue herons nest in rookeries along major rivers and reservoirs (Marcot, 1979). There are currently eight known heron rookeries on the Forest. The largest rookery once supported over 20 pairs. Active rookeries are protected by maintaining nest trees and other trees in the immediate vicinity.

Remaining species: Little is known about Forest populations of badger, red tree vole, prairie falcon, merlin, long-eared owl, purple martin, yellow warbler, and yellow-breasted chat. Many of these species generally are not associated with forested habitats. A very limited amount of moderate or high quality habitat for prairie falcon, merlin, long-eared owl, yellow warbler, and yellow-breasted chat occur on the Forest, and the species are rare to non-existent according to our sighting records. Therefore, they are seldom considered in habitat management direction or decisions. The remaining state Species of Special Concern do not currently receive management attention because they are believed to be very rare or absent from the Forest, and opportunities for increasing populations are extremely limited at the Forest level.

Harvest species and hunting:

Harvest species are those animals traditionally hunted or trapped. Commonly hunted species that inhabit the Forest include black bear, black-tailed deer, gray squirrel, mountain quail, California quail, blue grouse, ruffed grouse, turkey, band-tailed pigeon, wood duck, and mallard. Furbearing mammals which are trapped include mink, gray fox, raccoon, bobcat, and coyote (CDF&G, 1986).

Hunting and trapping provide recreation, food, and incidental income for thousands of people. Hunting opportunities on private land are limited to a few private hunting clubs and employees of timber companies with large land holdings. Other public lands in the vicinity of the Forest occur in federal and state parks and scattered Bureau of Land Management parcels. National Forest System land offers the greatest opportunities for hunting in Humboldt, Del Norte, and Trinity counties. Based on the number of licenses sold, the demand for hunting in these three counties appears to be leveling off or declining for most species, but increasing for black bear and turkey (CDF&G, 1989, 1989a, 1989b). Hunter days attributed to hunting game animals on the Forest are estimated at more than 49,000 annually.

The desires of hunters focus primarily on maintaining and increasing the number of deer available and supporting an elk reintroduction program that would eventually provide increasing populations of Roosevelt elk that could be hunted. Interest in turkey hunting has increased over the last decade, and hunters support the introduction of turkeys in suitable locations on public land. Some hunters favor road closures to ensure quality hunting; others prefer access to as much of the Forest road system as possible. The Forest has cooperated with CDF&G to close short road segments and provide winter closures to areas that are vulnerable to poaching. Information on each game species on the Forest is detailed below.

Black-tailed deer: Deer are the most commonly hunted mammal on the Forest. Deer prefer a mix of forest successional stages. Deer herds on this Forest, like most in California, have declined during the past 20 years and appear to have stabilized at their current population level (CDF&G, 1991). Actual causes for the population decline have not been determined, but possibilities include changes in plant succession, reduced forage quality, livestock competition, road construction, and increased predation and poaching.

The black-tailed deer population on the Forest is estimated at over 17,000 animals. The deer are found in 7 herds which have at least part of their range on the Forest: Smith River, Redwood, Happy Camp, Weaverville, Hayfork, Mad River, and Ruth. The Forest and CDF&G cooperatively prepared and implement management plans for each herd. These deer herd management plans include information on estimated population sizes, population trends, the location of key summer and winter ranges, and habitat quality. Information summarized in Table III-19 was extracted from management plans developed in 1986.

Summer and winter range provide essential habitat for deer herds. Summer range is generally above 4,500 feet and is primarily associated with wet meadows, brush fields, seeps, springs, and other riparian areas. Winter range is located below 4,500 feet and includes annual grasslands, brush fields, and hardwood stands. There are estimated to be 58,000 acres of key summer range and 222,900 acres of winter range on the Forest. Deer need about 40 percent key range maintained in forested habitats for thermal and escape cover.

Other important areas include migration or movement corridors between summer and winter ranges and the holding areas along these corridors. Opportunities for improving deer habitat conditions will be discussed in site specific timber management projects and District transportation plans.

Black-tailed deer is the most important game animal on the Forest. Over 35,000 hunters hunt annually in CDF&G hunting Zones B1 and B2 (which include the Forest), harvesting over 4,000 deer. This accounts for 16 percent of the state-wide deer harvest according to CDF&G records (CDF&G, 1991). However, hunter days attributable to deer hunting in this area have declined by 40 percent over the last decade.

Black bear: Black bears occur throughout the Forest. They utilize mature forests with brush fields and meadows, denning in uprooted trees, windfalls, hollow trees, and down logs (Marcot, 1979). Local populations are well distributed, and the current population of about 1,400 bears is believed to be stable. The highest bear densities are in the Trinity Alps and Siskiyou Wildernesses, which provide large undisturbed refuges from which the bears can disperse. These areas are unroaded and generally difficult to hunt with hounds.

Historically, over 50 percent of the state harvest of black bears have been killed in the Klamath Province (Region 1 of the CDF&G) of northern California, according to state harvest records (CDF&G, 1989b). Harvest appears

Table III-19
Summary Statistics for Seven Deer Herds.

| Deer herd | Ranger District | Deer herd area (ac) | Percent of area popu-on SRNF | Est. Animal on SRNF | Estimated lation density | Key areas |
|---|---|---|---|---|---|---|
| Smith River | Smith River NRA | 418,400 | 65% | 3,200 | 4.8/sq mi | Patrick Creek |
| | Orleans | | | | | Big Flat |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Redwood Creek | Orleans | 200,000 | 25% | 1,400 | 4.3/sq mi | Le Perron Peak | |
| | L.Trinity | | | | | | |
| Happy Camp | Orleans | 11,000 | 1% | 55 | 3.2/sq mi | none on Forest | |
| Weaverville | L.Trinity | 27,580 | 3% | 430 | 10.0/sq mi | S.Fk.Trinity R | |
| Hayfork | L.Trinity | 5,120 | <2% | 80 | 8.0/sq mi | S.Fk.Trinity R | |
| Mad River | L.Trinity | 115,000 | 13% | 3,100 | 18.0/sq mi | Morton Ranch | |
| | Mad River | | | | Friday Ridge | | |
| | | | | S.Fk.Trinity R | | | |
| | | | | Bug Creek | | | |
| | | | | S. Fk. Mtn. | | | |
| | | | | Pilot Creek | | | |
| | | | | North Lassics | | | |
| | | | | South Lassics | | | |
| | | | | Mad River | | | |
| | | | | Van Duzen River | | | |
| Ruth | Mad River | 180,500 | 47% | 9,300 | 30.0/sq mi | S. Fk. Mtn. | |
| | | | | South Lassics | | | |
| | | | | Mad River | | | |
| | | | | Van Duzen River | | | |
| | | | | Soldier Rock | | | |
| | | | | Salt Creek | | | |
| | | | | Duncan Creek | | | |
| TOTAL | | 957,600 | | 17,565 | | | |

to have doubled during the last decade over most of the Forest. While there was a moratorium on black bear hunting in 1989, the 1990 bear season was reported to be similar to the 1988 season, reflecting a continued high interest in bear hunting. An estimated 2,700 hunters have harvested 298 bears over the past decade in the 3 counties that occur on the Forest.

Roosevelt elk: Roosevelt elk were reportedly eliminated from the Forest in the early 1900s, and initial attempts to reintroduce them in the 1950s and early 1960s were unsuccessful (Monroe, personal communication, 1991). An estimated 75,000 acres of moderate to high quality habitat for elk occurs on the Forest. Livestock and deer have replaced elk on their historic range. Roosevelt elk are currently expanding their range from established herds at Redwood National Park, Prairie Creek State park, and the Siskiyou National Forest in Oregon. In addition, the Klamath National Forest has started an elk reintroduction program in an attempt to establish viable herds in the Siskiyou and Trinity Alps Wildernesses (which are shared with this Forest). Dispersing animals have been reported on the Smith River NRA and Orleans Ranger district.

Elk hunting has been limited to special hunts on private timber lands. The Forest is participating with an Interagency Roosevelt Elk group, under the leadership of the CDF&G, which is coordinating elk reintroductions throughout the Klamath Province. Several districts have initiated preliminary habitat assessments at potential release sites that are believed to have historically supported elk.

Western gray squirrel: Western gray squirrels are widespread over the hardwood and mixed evergreen portions of the Forest. Hunting appears to be relatively light and has declined over the last decade (CDF&G, 1989a). Squirrel numbers are strongly influenced by the seasonal production of fruit-bearing hardwoods (tanoak, California black oak, Oregon white oak).

Bobcat, gray fox, and coyote: Commercial trapping of bobcat, gray fox, and coyote occurs on the Forest, (CDF&G, 1986). The reported harvest by licensed fur trappers in 1984 in Humboldt, Del Norte, and Trinity counties was almost 1,900 pelts with an estimated value of $55,000. Harvest levels on the Forest alone are not known.

Grouse and quail: Upland game birds consist primarily of mountain quail, California quail, blue grouse, and ruffed grouse. They utilize a variety of vegetation types. California and mountain quail prefer timber stands with extensive shrub cover and low canopy closure. Blue grouse prefer open canopied stands of mixed conifer and fir with interspersed brush cover openings (Marcot, 1979). Ruffed grouse prefers riparian alder thickets. Hunting appears to be relatively light. However, interest in hunting these species may be increasing (CDF&G, 1989a). Quail and grouse have provided hunting opportunities for an estimated 17,500 hunters in the tricounty area.

Turkey: The Forest has a small population of wild turkeys, introduced in the 1970s, 1980s, and recently in 1992. Turkeys prefer wooded areas with a hardwood component and scattered grassy openings (Marcot, 1979). Turkeys are not hunted extensively on the Forest, although interest in turkey hunting has increased during the last two decades. The Forest has numerous areas with potentially suitable habitat and has proposed additional areas to CDF&G for consideration in their introduction program.

Band-tail pigeon: Band-tailed pigeons occur on the Forest, but little is known about current distribution. Populations are reported to vary considerably from year to year in response to varying environmental factors. They prefer open canopied, mature mixed evergreen forests (Marcot, 1979). Hunting pressure appears to be very light; and, while interest appears to be stable, hunter success is highly variable.

Waterfowl: Wood duck, mallard, and common merganser commonly use many of the ponds, lakes, and rivers for breeding, resting, and feeding. Wood duck and mallard nest in small ponds and lakes located throughout the Forest, and mergansers nest along the rivers. Wood duck nest boxes occur at several ponds and lakes on the Forest, and riparian habitat improvement projects were completed at selected ponds Forest-wide. They are occasionally hunted at some ponds on the southern half of the Forest.

Non-Consumptive Wildlife Use:

Of the 298 different wildlife species that occur on Six Rivers, about 7 percent are classified as game animals or furbearers. The vast majority of wildlife species occurring on the Forest are appreciated

by non-consumptive users. Many game species on the Forest also contribute to non-consumptive uses because many species are large and easy to see (for example, deer and bear). Non-game wildlife are recognized by the state as a natural resource that is increasing in importance every year (H. Pierce, CDF&G, personal communication, 1991).

Accurate figures for non-consumptive use are not available for the Forest. A national survey conducted by the Fish and Wildlife Service reported that for every day a hunter spent in the field, three other people were bird-watching or photographing or observing wildlife. Thousands of people boat or raft navigable portions of the local rivers every year, or ride their OHVs on designated routes and Forest roads. Viewing and photographing wildlife is an important part of their recreational experience. On the Six Rivers, the non-consumptive use of wildlife is expected to be at least twice that attributed to hunting and fishing.

Management Indicator Species:

The Forest has identified an array of management indicator species (MIS) and groups of species to evaluate the effects of various management alternatives. This was accomplished in coordination with neighboring National Forests, Redwood Science Laboratory (Pacific Southwest Forest and Range Experiment Station), and CDF&G. The species chosen vary in the types of habitats and habitat elements with which they are associated in an attempt to represent as much of the variability in habitat

Table III-20.
Management Indicator Species
Species are listed in taxonomic order under each heading. Habitat Capability Models exist for each species
(Appendix B).

INDIVIDUAL SPECIES
Northern spotted owl
Pileated woodpecker
Black bear
American marten
Fisher
Black-tailed deer

BOG/SEEP/TALUS/SPRING/
WET MEADOW ASSEMBLAGE
Del Norte salamander 1/
Olympic salamander

MARSH/LAKE/POND ASSEMBLAGE
California red-legged frog
Wood duck
Western pond turtle
Western fence lizard

RIVER/STREAM/CREEK ASSEMBLAGE
Tailed frog

SNAG ASSEMBLAGE
Flammulated owl
Western screech owl
Red-breasted sapsucker
Downy woodpecker
Hairy woodpecker
White-headed woodpecker
Vaux's swift
Brown creeper
Western bluebird
Douglas squirrel

DOWN WOODY MATERIAL ASSEMBLAGE
Clouded salamander
Arboreal salamander
Blue grouse
Dusky-footed woodrat

BLACK OAK/WHITE OAK ASSEMBLAGE

Common merganser Acorn woodpecker
Ruffed grouse Scrub jay
Winter wren Lazuli bunting
American dipper Western gray squirrel
Yellow-breasted chat
Cutthroat trout TANOAK/MADRONE ASSEMBLAGE
Rainbow/steelhead trout
Hammond's flycatcher
Western tanager
Black-headed grosbeak

1/ Talus does not have to be associated with riparian conditions.

conditions occurring on the Forest as possible. The MIS species list includes species which fall into one or more of the following categories.

1. Species dependent on snags, down woody debris, or wetland/riparian vegetation types.
2. Species clearly associated with a particular seral stage.
3. Species associated with hardwood trees or forests.
4. Popular game species.
5. Endangered, threatened, or sensitive species which have specific habitat needs.
6. Highly visible game and nongame species.

Six individual MIS species and seven multi-species assemblages (41 species total) representing a particular habitat condition or habitat element were selected to gauge the effects for each alternative proposed in this EIS and to monitor the effects of plan implementation. These species are listed in Table III-20. Each species within the multi-species assemblages is likely to respond somewhat differently to various management activities that may occur; however, it is the assemblage that will initially be monitored and not individual species. Monitoring several similar species will provide a better reflection of the range of responses expected from other wildlife species associated with a given habitat or habitat element. Monitoring multiple species is not expected to add significantly to the cost in time or funding because the selected survey techniques (for example, bird census and small mammal trapping) are expected to detect multiple species or in a few cases compliment the preferred technique. Habitat associations of each MIS species are briefly discussed below. The number of wildlife species with habitat associations similar to each MIS species is estimated using the California Wildlife Habitat Relationships Database System (Version 5, 1993), which is a computerized database containing information on the habitats and habitat elements used by each wildlife species occurring in California. See Appendix N of the EIS.

The Scientific Analysis Team (USDA, 1993) expanded the number of species closely associated with old-growth forest to be assessed and included invertebrates and non-vascular plants and fungi. They identified 667 species within the range of the northern spotted owl, and the Forest Ecosystem Management Assessment Team (USDA/USDI, 1993) evaluated these and additional species or species groups (over 1,000) in their assessment of the President's Forest Plan options. Information from these teams was incorporated into the FSEIS and ROD, to which this EIS tiers.

As the Forest begins to implement ecosystem management, the management indicator species concept will likely be included within broader environmental indicators, which include components (selected species), structures, and processes. A range of environmental indicators is more likely to address the complexity of ecosystems (USDA, 1994). The Forest also expects the revision of the planning regulations will lead to a re-evaluation of these MIS species to incorporate species or species groups of concern to the scientific assessment teams, while working towards the multi-species approach envisioned by the FSEIS ROD. The Forest is considering the following strategies: establishing a Forest carnivore assemblage that would include the fisher, marten, and black bear; including the pileated woodpecker with the species in the snag assemblage; and dropping the Del Norte salamander as an MIS, since it is not always riparian and would be monitored as a "Survey and Manage" species (FSEIS ROD, 1994). Any future evaluations for potential indicators would revisit the bat species and include invertebrates.

Northern spotted owl: The habitat associations of spotted owls are discussed in detail in the threatened and endangered species section of this chapter. Spotted owls are expected to be sensitive to changes in habitat quality because they are fairly habitat specific, and they represent the habitat needs of approximately 141 wildlife species that use mature and late-successional forest habitat for all or part of their life cycle. The Forest has intensively surveyed most of its forested land for spotted owls over the last 14 years. The Forest will continue to monitor selected sites to meet Regional spotted owl objectives and recovery plan goals.

Pileated woodpecker: Suitable and optimum pileated woodpecker habitat is similar to conditions preferred by the spotted owl and the fisher. Pileated woodpeckers prefer multi-storied mature and late-successional conifer forests with moderate to dense canopy closure, and scattered patches with 6 to 8 large snags per acre and abundant down logs. This woodpecker forages primarily in dead wood; therefore, both standing snag and down log densities are important indicators of habitat quality. Research efforts in Oregon and California (Bull, 1975; Bull and Meslow, 1977; Shimamoto and Airola, 1981; Mannan, 1984) show that breeding territories generally range from 320 to 600 acres. These researchers recommend maintaining a minimum of 350 acres to ensure a reproductively successful pair of pileated woodpeckers. Territories appear to range from 1,000 to 1,300 acres during the non-breeding season (Mannan, 1984). As a result, additional moderate and high quality habitat needs to exist in the vicinity of the breeding territory to support the pair and young during the non-breeding season.

The abundance and distribution of pileated woodpeckers on the Forest are not well known. A study on habitat use by the pileated woodpecker is nearing completion (Christgau, 1991). This study has documented foraging use in younger early mature Douglas-fir forest, and that use of mature and late-successional forest stands are similar. However, pileated woodpeckers are fairly common on the Forest. Although comprehensive surveys for this species have not been conducted, estimates (based on sighting records, suitable habitat requirements, and behavior) suggest a population of up to 320 pairs. An estimated 360,000 acres of moderate or high quality habitat for pileated woodpeckers occur on the Forest in seral stages 4A and 4B/C. Reserved areas (Wilderness, Wild River corridors, Research Natural Areas, and late successional reserves) could provide habitat for up to 280 pairs. Natural and management-induced fragmentation are believed to have reduced the amount of moderate and high quality habitat on the Forest.

Pileated woodpecker is expected to be a good indicator species because it is habitat specific, it requires large snags and logs as do many other species of wildlife, and it is still fairly common and well distributed. The more common a species is when monitoring begins, the easier it is to detect population trends and determine its response to various intensities of forest activities. Pileated woodpeckers represent the habitat associations of approximately 205 wildlife species which utilize mature and old-growth forests, snags, and logs.

Black bear: The habitat associations of black bear are discussed in detail in the hunting and harvest species section of this chapter. Black bear was selected as an indicator species because of its habitat association with mid- and late-successional stages of all forest vegetation types and unique meadow types and its large down log requirements. Black bear represents the habitat needs of approximately 247 species which utilize mid- to late-successional stage forests. Approximately 9 percent of wildlife species on the Forest require large logs for some aspect of their life history.

American marten: The habitat associations of marten are discussed in detail in the Forest Service sensitive species section of this chapter. Marten is a good indicator of habitat quality because it appears to be uniquely associated with true fir vegetation types, it is habitat specific, and it requires large logs or deadfalls for resting and denning. It represents the habitat needs of approximately 172 wildlife species which utilize high elevation mature and late-successional Klamath and Coast Range montane (true fir) forests.

Pacific fisher: The habitat associations of fisher are discussed in detail in the Forest Service sensitive species section of this chapter. Fisher is a good indicator of habitat quality because it is habitat specific, and it represents the habitat needs of approximately 169 wildlife species which utilize mid-elevation mature and late-successional mixed evergreen forests on the Forest. It also represents wildlife species which use large cavities and concentrations of down woody debris for denning or nesting.

Black-tailed deer: The habitat associations of black-tailed deer are discussed in detail in the hunting and harvest species section of this chapter. Black-tailed deer was selected as an indicator species because of its association with early- and mid-successional stages of all forest vegetation types and unique meadow and hardwood types. Black-tailed deer represent the habitat needs of approximately 247 wildlife species which utilize early and mid-successional stages of forested habitat.

Bog/seep/spring/wet meadow/talus assemblage: Densely vegetated wet areas provide a unique habitat for up to 102 species of wildlife. These unique habitats occur throughout the forest, and are generally maintained by the Forest wildlife standards and guidelines. Two wildlife species, the Del Norte salamander and the Olympic salamander, are dependent on these special habitats to meet life requirements.

Marsh/lake/pond assemblage: Standing open water in the form of ponds, lakes, and marshes provide special habitat for over 59 species of wildlife. There are over 150 ponds, lakes, and wet meadows throughout the Forest. These special habitats occupy approximately 500 acres on the Forest. The 3 wildlife species (red-legged frog, western pond turtle, and wood duck) dependent upon these special habitats are varied in their life history and habitat requirements. The 3 species represent sensitivities to water chemistry, large woody debris, adjacent forested habitats, and disturbance.

River, stream, and creek assemblage: Moving open water provides unique habitat for over 61 species of wildlife. There are an estimated 5,674 miles of rivers, streams, and creeks on the Forest. These riparian habitats, including their adjacent riparian management areas, cover approximately 159,500 acres on the Forest. The eight wildlife species (see Table III-20) dependent upon these special habitats are varied in their life history and habitat requirements. These eight species, collectively, represent sensitivities to water quality (chemistry and temperature), snags and large woody debris, adjacent forested habitats, and disturbance.

Snag assemblage: Snags are standing dead trees. Up to 59 wildlife species occurring on the Forest depend upon snags for feeding, breeding, or resting. Large snags are particularly valuable for wildlife because they provide cover for larger-bodied wildlife species and a greater abundance of prey. Ten wildlife species (see Table III-20) were chosen to represent species which depend upon snags for some aspect of their life history, and they include the white-headed woodpecker and flammulated owl which were identified in the FSEIS ROD (1994) for protection utilizing special snag standards. Snags are particularly important for cavity-nesting species. The group of 10 species includes both primary (excavate cavities) and secondary (use existing cavities) cavity nesters.

Down woody material assemblage: Down woody material consists of logs or large branches on the forest floor. Over 53 wildlife species occurring in the Forest depend upon down woody material for feeding, breeding, or resting; 21 of these species require down logs. Five wildlife species (see Table III-20) were chosen to represent species which depend upon down woody material for some aspect of their life history. These five species depend upon down woody material for a variety of needs.

Black oak/white oak assemblage: California black oak and Oregon white oak are important vegetation types and habitat inclusions because the acorns they produce provide an abundant and highly nutritious food resource. An estimated 205 wildlife species occurring in the Forest utilize the hardwood forests for feeding, breeding, or resting. Nine wildlife species are dependent upon acorns for some aspect of their life history. Oaks are an important source of natural cavities which are vital to species which need existing cavities for some aspect of their life history. Four species (see Table III-20) were chosen to represent black and white oaks in the Forest landscape. They have a variety of needs and uses for oaks, including feeding and nesting.

Tanoak and Pacific madrone assemblage: Tanoak and Pacific madrone are common components of the Douglas-fir mixed evergreen vegetation type. Tanoak is valuable to wildlife because it produces acorns and has a greater abundance of natural cavities compared to conifers (as do most hardwoods). Madrone produces berries which provide an important food source to wildlife, particularly in the fall. It is also frequently used as a nest tree by cavity excavators. Over 50 species of wildlife are dependent upon the special hardwood habitat component for some aspect of their life history. Three species (see Table III-20) were chosen to represent tanoak and madrone as a component in the Forest landscape.

National Wildlife Emphasis Areas:

Nation-wide, the Forest Service has initiated many programs that focus on different species groups which collectively should address the full array of wildlife and their habitat throughout the U.S.

Every Species Counts program focuses on the recovery of threatened and endangered wildlife species and the conservation of sensitive species. The Forest pioneered inventory and habitat improvement efforts for the peregrine falcon and marbled murrelet and has been recognized as a leader in spotted owl management. Opportunities for this emphasis area are tied to the forest goal of moving away from single species management toward an ecological approach of managing habitat for wildlife species that would ensure biological diversity is maintained from a landscape perspective.

Get Wild! is the name of the Forest Service's terrestrial wildlife habitat and information program that focuses on maintaining healthy and diverse populations of those species that are not threatened, endangered, or sensitive species. This program seeks partnerships outside the Forest Service with State and local wildlife agencies and with the diverse user groups interested in maintaining healthy wildlife populations for viewing and hunting.

Eyes on Wildlife works with partners to provide opportunities for viewing "watchable wildlife species" and developing viewing areas. Efforts are currently underway to work with the American Birding Association to prepare a birder's guide to the National Forests. The California Wildlife Viewing Guide currently lists 14 locations on the Forest where wildlife can be observed.

Partners in Flight is a relatively new program that focuses on the conservation of declining neotropical migrant bird populations. This is a cooperative program, and a memorandum of understanding has been developed with several environmental and conservation groups. This program would initiate Forest-wide monitoring of neotropical bird species to determine habitat interrelationships and population trends. A project is currently underway to monitor productivity and survivorship, in forest riparian habitats, in the Klamath and Trinity watersheds. The Forest, in partnership with the local Audubon Chapter, has also established breeding bird survey (BBS) routes through the major forest types on each Ranger District.

Animal Inn program focuses on conservation education that "there's life in dead trees" to protect and retain snags and down logs. This program provides educational material to forest users, particularly firewood cutters, that promotes the importance of snags and down logs as special wildlife habitats and key elements in nutrient recycling.

Making Tracks program capitalizes on a partnership with the Wild Turkey Federation and State wildlife agencies to encourage the introduction of wild turkey into suitable habitat on the National Forests. The Forest has coordinated with California Department of Fish and Game in introducing wild turkeys at several locations on the Mad River Ranger District.

Taking Wing program works with Ducks Unlimited and local sportsmen's groups to develop waterfowl habitat management programs on each Forest. The Forest has placed wood duck nest boxes at numerous ponds throughout the Forest. In addition several ponds have been improved for waterfowl and other pond dependent species.

Dancers in the Forest works with the Ruffed Grouse Society to develop opportunities for grouse habitat enhancement.

Elk Country program works with the Rocky Mountain Elk Foundation and local hunting groups to re-introduce elk within its historic range. Northwestern California was historically home to the Roosevelt elk. The Forest has participated with the Roosevelt elk working group, on developing a multi agency MOU and as technical advisors on re-introductions proposed on neighboring forests.

Opportunities

Consumptive Use: Wildlife "harvest" species will continue to provide hunting and trapping recreation for thousands of people. The Forest will continue to cooperate with CDF&G to maintain deer herds and support re-introduction programs for Roosevelt elk and other game species. The Forest will seek public input as project-specific changes in road management are proposed in order to consider the needs and desires of hunters as well as other NFS land users. Cooperation with CDF&G to close short road segments, and provide seasonal [winter] closures to areas that are vulnerable to poaching, will also continue.

Nonconsumptive Use: The Forest will continue to be a place where bird-watchers, campers, hikers, photographers, boaters, naturalists, off-highway vehicle enthusiasts, casual sightseers, and others will be able to enjoy viewing a variety of wildlife.

Wildlife Management Strategies: Wildlife are an important part of the Klamath ecosystem, and several species are culturally significant to the area's Native Americans. If all wildlife species that presently occur on the Forest are to maintain viable populations, it will require the preservation or protection of sufficient amounts of suitable habitat as well as maintaining connectivity between these habitats to ensure adequate dispersal and recolonization of vacant habitat areas. Unique wildlife habitats and special habitat components are also essential to maintain native wildlife populations.

A significant amount of land on the Forest has already been reserved to meet wildlife and other resource needs (wilderness, wild and scenic rivers, research natural areas, and late-successional reserves). A single managed habitat area is proposed for the American marten to maintain dispersal habitat and develop management prescriptions that would maintain or improve habitat quality to ensure martens are well distributed over the forest. The Forest has proposed a network of travel corridors that extend over ridges and saddles and connect with the extensive riparian reserve areas to provide connectivity or mature forest habitat ties between watersheds. The 100 acre spotted owl areas will also contribute to dispersal between the large reserves. Connectivity between reserved lands and designated wildlife areas is essential, due to the lack of adequate inventory data and the high probability that many of the areas which are currently expected to contribute to the maintenance of viable populations may be vacant (not occupied by the target species).

The late-successional reserves, in conjunction with Congressionally and administratively withdrawn land provide well distributed forest habitat of sufficient size and spacing for mature and late-successional associated species. Designated habitat areas (special or managed) are composed of contiguous suitable habitat with the capability to support successfully breeding pairs of a specific TES wildlife species. Harvest within designated wildlife habitat areas (outside these reserves) could occur to improve habitat quality or when adjacent forested areas provide similar habitat that is capable of supporting these late successional associated species. The continued dependence on

wilderness and other reserved areas as an integral part of habitat networks may limit the amount of shifting possible.

Wildlife objectives can generally be met on reserved lands, lands allocated to wildlife species, and on managed lands that maintain special habitat components. Standards and guidelines can be used to establish objectives to meet specific habitat needs (such as snags, down logs, and hardwood retention) in the timber regulated land base and protect occupied habitats during the sensitive breeding period (see Table III-13). There is uncertainty about the quantity, quality, and distribution of habitat needed to maintain viable populations of most wildlife species, and this is further discussed in the FSEIS [1994, pg 3&4-237]. The Habitat Capability Models (Appendix B) have incorporated the most current information available, and should be validated during the planning period as an integral part of the monitoring plan. Conservation strategies will be developed for selected candidate and Forest Service sensitive species to provide sufficient protection of existing populations to preclude the need for their listing. Habitat improvement projects in managed wildlife habitat and other areas can be designed to meet specific wildlife objectives (including the enhancement of existing nest or den sites or the re-introduction of extirpated species into unoccupied habitats). Knutson-Vandenberg (K-V) funding can be used to implement projects in timber sale areas.

Threatened and Endangered Species: The primary objective of a recovery plan is to provide secure habitat and increase the populations in specific geographic areas (zones) to levels that permit the delisting of the species. The recovery plans have established criteria for nest site protection and essentially govern the management of these species on the Forest. The Forest has established an endangered species management area that protects essential habitat and contributes to recovery plan objectives for the bald eagle and the peregrine falcon. The Forest is consistent with the FSEIS ROD for both the northern spotted owl and marbled murrelet, and proposes to adopt the “adaptive management” process discussed in the FSEIS ROD to achieve our contribution to recovery.

Management Indicator Species: Habitat for the indicator species can be provided at various levels, from meeting their minimum requirements to preserving most of their respective suitable habitat (mature and old-growth forest). While existing reserved lands and riparian reserve areas contribute substantially to meeting the minimum requirements for most of these species, additional managed wildlife habitat areas can be established to maintain viable well distributed populations and provide connectivity to encourage dispersal into unoccupied habitat areas. When needed, secondary habitat will exist in the managed forest matrix that occurs in the general forest management area outside reserved lands.

Special wildlife habitat components will occur at near natural levels in areas not available for timber management. Snags, down woody material, and hardwood retention guidelines have been in effect on the Six Rivers since 1979. The current direction (FSEIS ROD, 1994) would retain down logs or coarse woody debris at near natural levels forestwide and snags at minimum of 40 percent of background levels (additive by species based on the Snag Recruitment Simulator) on matrix or Adaptive Management Area (AMA) land. High elevation white fir and red fir would be managed to maintain soft snags for the white-headed woodpecker at the 100 percent level. Hardwoods can be retained at various levels, depending on site characteristics and the ability of the area to contribute to specific wildlife objectives (see Table III-13).

Unique wildlife habitats, including riparian and wetlands, are protected by NFMA and the Forest standards and guidelines. Buffer areas (up to two site potential trees or 300 feet in width) surrounding ponds and meadows can be managed for wildlife species which utilize that habitat. Meadow and wetlands would be managed to improve their ecological condition and maintain their value to wildlife. Unique habitats can be withdrawn from timber harvest and managed to meet wildlife objectives.

Deer and Elk Herds: Habitat capability is expected to diminish when the amount of regenerated acres created each year decreases and commercial thinnings and other selective prescriptions begin to comprise a significant portion of the programmed harvest. Considering the amount of mature and old-growth forest set aside for Smith River NRA and the spotted owl, the size of the deer herds are expected to decline and then remain relatively stable for several decades. Timber harvest and catastrophic events such as large fires have created the existing forage/cover ratios, and will continue to cause the long-term fluctuations in this ratio. While the elk has just begun to re-occupy suitable habitat on the Forest, habitat capability for the elk is expected to follow the same general pattern as the deer. Elk numbers are expected to increase during the next decades as new areas are colonized.

While wildlife is usually compatible with most recreational uses, increased disturbance from this use during the critical breeding season can disrupt breeding activity or displace breeding animals. The Forest can administratively control access, both year long and seasonally, to areas that recreational use could adversely affect (Jones and Stokes Assoc. Inc., 1991).

The extent and intensity of monitoring will depend on the status of a particular species, the degree of impact expected from a proposed activity, and the funding available to implement the forest program of work. The first priority has always been to achieve the recovery plan objectives for federally listed threatened and endangered species, specifically the bald eagle, peregrine falcon, northern spotted owl, and marbled murrelet. The Forest's second priority for monitoring generally focuses on federal candidate species and regional sensitive species to ensure that our management provides for these species to the extent that precludes the necessity of listing. The Forest would also monitor the effect of proposed management activities on selected management indicator species. Monitoring will be a key element of any plan which uses active adaptive management to develop suitable habitat for wildlife species. See Chapter 5 of the Forest Plan for more information.

Affected Environment in Context with Alternatives

Forest Fragmentation: Habitat fragmentation is the increase in isolation and the decrease in size of habitat patches. Habitat fragmentation affects the quality of dense old-growth forests by creating changes in type and quality of the food base, changing microclimate by altering temperature and moisture regimes, changing the availability of cover, bringing species together such as nest parasites, competitors, and predators, and increasing contact with and exploitation by humans (Morrison et al., 1992). Fragmentation of old-growth habitats affects species richness of communities, population trends of some species, and overall biological diversity of the ecosystem (Morrison et al., 1992), and threatens the maintenance of viable wildlife populations (Lehmkuhl and Ruggiero, 1991).

Microclimate patterns (air temperature, relative humidity, soil temperature, and wind speed) and associated biological features (for example, species composition) differ between cut areas, cutting

boundaries, and interior forests (Spies et al., 1990). Microclimate effects from edge extend “two tree lengths “ or approximately 400 feet into the forest interior (Harris, 1984; Franklin and Forman, 1987; Spies et al., 1990). Thus, fragmentation of old-growth forests is a concern for a number of plant and wildlife species associated with forest interior conditions which are adversely affected by the proximity of early seral stage vegetation and associated edges.

Connectivity: Dispersal and movement between habitat patches is critical to long-term viability of plant and animal populations. While knowledge of dispersal patterns is incomplete, landscape patterns play an important role in either facilitating or inhibiting dispersal (Noss and Harris, 1986). Forest Service regulations (36 CFR 219.19), in response to NFMA, require the maintenance of viable populations that are well distributed throughout their current geographic range. A variety of strategies employed concurrently may accomplish this: providing large contiguous stands of mature and old age, closed canopy forest conditions (for example ecological or movement corridors) is one facet of this strategy; 100 acre habitat areas at spotted owl activity centers that occur in the matrix or AMA is another; and riparian reserves still another. See the Biological Diversity section of this chapter for more information.

The wildlife issues will be carried forward and analyzed in Chapter 4.

FISHERIES

Public Issues

Issue 3 How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian systems?

Issue 13 How will the Forest maintain or improve the quality and quantity of spawning and rearing habitat?

Current Situation

Anadromous Fish Resource: The primary fishery resource on the Forest is the anadromous fish production of the Klamath, Trinity, Smith, Mad, and Eel rivers and their tributaries. The Klamath, Trinity, and Smith river watersheds support the bulk of the fishery. The current population levels of chinook salmon in the Klamath and Trinity rivers are so low that there is little economic yield from the remnant fisheries. The management of these reduced populations dictates that the fishery be restricted for all stocks subject to commercial and sport fisheries in the ocean. In 1993, ocean commercial salmon harvest was closed from just north of San Francisco to the Canadian border, with only minor exceptions. The sport fishery was closed in Northern Oregon and Washington, and subjected to severe quotas from central Oregon to just north of San Francisco. Quotas were also imposed on in-river fisheries for salmon. Steelhead are harvested only by sports anglers in freshwater, and make a substantial contribution to the economies of communities near the rivers. In addition to the Klamath and Smith river systems, the Forest provides habitat for steelhead in the headwaters of the Eel, Mad, and Van Duzen rivers. Locally important fisheries include resident trout (primarily rainbow and cutthroat), green sturgeon, and American shad in the Klamath River and warmwater fish in Ruth Reservoir.

Figure III-12. This stream is characterized by good quality anadromous fish habitat, with spawning gravels, shade cover, and dead and downed woody materials for instream habitat diversity.

Indian Tribal fisheries are an integral part of the management of the anadromous fisheries in the Klamath River system. The fishery, both commercial and subsistence, is primarily focused on the fall chinook salmon, which occurs primarily downstream of the Forest on the Yurok and Hoopa reservations. A small subsistence fishery occurs upstream of the Forest, near Ukonom, carried out by the Karuk Tribe. The Indian harvest is subject to a quota, devised annually in conjunction with ocean harvest restrictions to allow approximately one-half of the returning natural fall chinook to spawn. The Indian subsistence fisheries have also been subject to severe constraints, due to the current low population levels. There is a much smaller tribal fishery for steelhead and green sturgeon.

The Forest watersheds make a major contribution to the anadromous fishery of the Klamath, Trinity, and Smith rivers. The contribution of the Forest watersheds to the anadromous fishery of the Mad, Van Duzen, and Eel rivers is comparatively small, because the major habitat for salmon and steelhead on these rivers occurs downstream of the Forest. Anadromous fish are defined by the characteristics of spawning in freshwater; emigrating to the ocean after a few months to several years, depending on species, and growing to adulthood in the ocean in two to five years. The production of anadromous fish, is governed equally by the freshwater and marine environments. The Forest provides habitat for these anadromous species: chinook, or king salmon (Oncorhynchus tshawytscha), coho salmon (O. kisutch), steelhead (O. mykiss), coastal cutthroat trout (O. clarki), green sturgeon (Acipenser medirostris), white sturgeon (A. transmontanus), and American shad (Alosa sapidissima).

The strong homing tendency of anadromous fish leads to the evolution of sub-populations or “stocks” which develop specific adaptations to their native environment (Ricker, 1972). Nehlsen et. al. (1991) emphasizes that it is at the stock level that conservation and rehabilitation of salmon, if it is to be successful, must take place. In 1991 the American Fisheries Society identified 159 stocks of anadromous fish in the Pacific Northwest as being at moderate to high risk of extinction (Nehlsen et al., 1991). Another 54 stocks were listed as being of special concern. A total of 39 stocks in California were listed. Higgins et al., (1992) evaluated the anadromous stocks in only northern California and identified 20 stocks at high risk of extinction, 3 at moderate risk, and 26 of special concern. Twelve of the high or moderate risk stocks have habitat on National Forests.

The continued existence of these stocks is threatened by a combination of hydro-electric development, over-fishing, habitat conditions, and influence of hatchery fish on both disease resistance and genetic fitness of native stocks. High quality habitat on National Forest System lands is essential to conserving many of the “at risk” stocks. Enlightened management of anadromous fish habitat can be important to the recovery of these stocks, even though the primary reasons for the decline may not be related to degradation of habitat.

Coho salmon populations have declined so precipitously along the Pacific Coast that they are currently being evaluated for protection under the Endangered Species Act. Coho occur on the Forest only in very low numbers in the Klamath and Smith River watersheds.

Green sturgeon occur in the Klamath River. This species is currently listed by the U.S. Fish and Wildlife Service as a candidate for listing under the Endangered Species Act. The “candidate” status encourages further investigations of the health of individual populations. The harvest of green sturgeon by the lower Klamath River Indian fisheries has been relatively stable for the past 12 years averaging about 200 adults. In 1993, 417 green sturgeon were taken in the gill-net fishery. The California Department of Fish and Game (CDF&G) has recently closed the Klamath River to sport harvest of this species, primarily because of the frequency of illegal harvest.

Summer steelhead occur on the Forest and are classified by the Forest Service in Region 5 as a sensitive species. This designation requires that habitat for the summer steelhead be maintained or enhanced. This unique fish returns to the river or stream from spring to early fall and remains in deep pools until spawning occurs in winter of the following year. The long freshwater holding time renders the adult summer steelhead especially vulnerable to predation and habitat changes. Individual stream populations on the Forest are generally less than 100 fish. Some streams have average populations of less than 50 fish. The American Fisheries Society (Higgins et al., 1992) has identified the summer steelhead of the Mad, North Fork Eel, Klamath, and Trinity rivers as being at high risk of extinction.

A State-wide steelhead management plan is currently being developed by the CDF&G. Current management direction for summer steelhead is provided by the Regional Guide (U.S. Forest Service, 1984). Biological evaluations are required for all proposed projects that have potential to affect summer steelhead or their habitat.

Klamath-Trinity River System: The Forest contains about 15 percent of the total Klamath-Trinity River watershed. The Forest portion includes several important spawning tributaries for salmon and steelhead. Spawning escapement1/ levels for fall-run adult chinook salmon in the Klamath-Trinity basin between 1980 and 1993 has ranged from 11,000 to 21,000. This low population level has occurred in spite of severely constrained fisheries in both the ocean and river. The Framework Plan of the Pacific Fisheries Management Council calls for a minimum escapement of 35,000. The natural escapement in 1992 was estimated at only 11,000 fish, the lowest return in the last twenty years. The natural escapement in 1986 was 113,000. Historic levels of fall chinook may have exceeded 500,000 (as estimated by the CDF&G).

1/ Number of fish that elude capture and successfully return to spawning.

The CDF&G estimates that an escapement of as much as 106,000 fall-run chinook salmon is needed to adequately occupy the currently available spawning habitat in the Klamath-Trinity river system (Boydstun and Hubbell, 1985). Although both quality and quantity of available spawning habitat have declined (that is, the current habitat would not support the historic level of spawners), the very low number of fall chinook salmon returning to spawn is presently the dominant factor in the recovery of this population (see discussion under Management Opportunities).

Steelhead provide the major sport fishery in the Klamath-Trinity river system. The steelhead population as reported by McEwan (1994) ranged from 87,000 to 181,000 for the period of 1977 through 1982. No estimates for the entire system have been done since that time, but angler success has been very low in the past several years. The steelhead fishery is primarily supported by the

“half-pounder.” The “half-pounder” is found in only three rivers in the world, the Klamath and Eel in California, and the Rogue in Oregon. The “half-pounder” is a steelhead of 10 to 16 inches in length that returns to freshwater after only a few months in the ocean. After living about eight months in freshwater, they return to the ocean, grow there for one to two years, and immigrate up-river as adults to spawn. They are eagerly sought, especially by fly-fishers, because of their fighting ability and aggressiveness in taking a fly. The apparent abundance varies, but they are very numerous in some years. The “half-pounder” provides a major share of the sport fishery in the Klamath-Trinity river system.

Approximately 10 percent of the Trinity River watershed is on the Forest. Major reductions in anadromous fish populations have occurred in this river, primarily as a result of the construction of Trinity Dam that blocked over 100 miles of steelhead habitat. Frederickson and Kamine (1980) estimated that, in comparison with a 1950 base, the upper river steelhead population has declined by 90 percent and the lower river by 80 percent. In the period of 1980 to 1992, the steelhead population was estimated to range from 8,000 to 37,000. The most recent estimate was 11,400 in 1992 (McEwan and Jackson, 1994). Natural chinook salmon populations have also had major declines, although the Trinity River Hatchery has mitigated some of this loss, especially with regard to spring-run chinook. Some of the major factors commonly cited as possible causes of this reduction include loss of habitat due to construction of Trinity Dam, degraded habitat below the dam, the 1964 flood, over harvest of salmon, and poor logging practices (Rankle, 1980).

Smith River System: Approximately 85 percent of the Smith River watershed is within the Smith River NRA, which is managed by the Forest. Little data is available on the size of the anadromous fish population in the Smith River. Chinook salmon and steelhead are the dominant anadromous fish. Coho salmon are widely distributed in the basin in generally low numbers. The most significant populations occur in tributaries downstream of the Forest boundary. Only occasional spring-run chinook and summer steelhead are observed. Historically, spring-run salmon were harvested by Indian tribes and commercial canneries. Anadromous coastal cutthroat trout are widely distributed throughout the system, but occur in relatively low abundance.

The large size of Smith River salmon and steelhead has given the river national prominence among sport fishing enthusiasts. The State record steelhead, weighing just over 27 pounds, was caught in the Smith River. The habitat quality and quantity in the Smith River system is superior to the Klamath River. Spawning gravels generally have low levels of fine sediment, and water temperatures seldom are above the mid-sixties. The resistant rock commonly occurring in the Smith watershed increases the complexity and quality of in-stream habitat for salmonids. The 1964 flood caused a drastic decline in the quality of the fish habitat in the river. Since that time, the habitat has been recovering, but is still below optimum. No data is available on the recovery trend of the anadromous fish population since the flood. Biologists familiar with the Smith River system generally agree that the chinook salmon population is well below the capacity of the habitat. The steelhead population is probably greater than the chinook. Biological surveys indicate that juvenile steelhead are abundant in the natal streams and in the river.

Resident Fish Populations: A variety of resident fish inhabit Forest waters. Resident rainbow trout are present in most headwater streams on the Forest, primarily in stream sections not available to anadromous fish because of natural barriers. A significant portion of the resident trout habitat on the Forest can be rated as marginal because of the very low late summer flows, especially in the Mad

and Van Duzen river watersheds. Small populations of resident cutthroat and brook trout are present in local areas. The contribution of resident trout to sport fishing on the Forest is very small in comparison with that for steelhead and salmon. The small-stream trout resource, however, does provide ample opportunity for those anglers who seek small, native trout in remote, relatively pristine streams. The resident trout fishery is an under-exploited resource and has a much greater capacity for use than is currently made by the angling public.

Other resident game species on the Forest include bluegill, crappie, largemouth and smallmouth bass, brown bullhead, and brown trout. The significant warmwater fishery occurs in Ruth Reservoir as discussed below. Many non-game species are also present on the Forest, including four species of sculpin, four suckers, two chubs, speckled dace, and California roach. Population levels of non-game species of fish on the Forest have not been thoroughly assessed. The numbers and habitat occupancy of these species are recorded during biological stream surveys, which primarily focus on salmonids.

Figure III-13. This stream is characterized by poor quality anadromous fish habitat, with little available spawning gravels, no shade cover, active erosion of fine sediment, and a poorly developed riparian zone.

A total of 15,000 catchable-size trout are released annually at Ruth Reservoir, providing a major share of the sport fishery. Black bass and black crappie provide a very popular fishery at this scenic reservoir in the headwaters of the Mad River, in the southern portion of the Forest. In addition to bass, anglers seek catfish, black crappie, and bluegill in the reservoir. Kokanee salmon fingerlings were released in Ruth reservoir from 1980 through 1984 in an attempt to provide an added fishery and an increased prey base for bald eagles. A specialized fishery for kokanee has developed, but the CDF&G has discontinued the program, depending upon the findings of the ongoing evaluation of natural reproduction.

Rainbow and brook trout are present in a total of 13 natural lakes on the Forest. Fish Lake has an area of 28 acres, but most are less than five acres. The fisheries are primarily supported by CDF&G releases of catchable or fingerling trout. Four lakes are within Wilderness. The policy on release of non-indigenous fish species into Wilderness waters is currently under review by the Forest Service nationally. The largest sport fishing use of a natural lake is at Fish Lake where 10,000 catchable rainbow are released annually. The lake also supports populations of bluegill and largemouth bass.

Opportunities

Habitat Improvement: The fundamental goal of restoration should be to reestablish the ability of the ecosystem to maintain its function without human intervention (Gregory, 1994). Physical modification of stream habitat should be used as an interim measure designed to enhance natural recovery. For example, a riparian area with the complete array of basic functions and processes should provide complex habitat, formed by both wood and rock.

Anadromous fish are unique because of their essential dependence on fresh water habitat for spawning and juvenile rearing. Researchers and managers recognize three factors as having the

greatest potential to affect the quality and quantity of fish habitat. These factors are water temperature, fine sediment, and habitat complexity or cover. Increased stream temperature reduces the growth rate of fish and, in extreme cases, may make the habitat unsuitable for cold-water fish. Increased water temperature results when stream shade canopy is reduced. Current Forest practice is to maintain all trees and shrubs within 100 feet of fish-inhabited streams. Fallen trees are an important contributor to complex instream cover for salmonids. In many streams on the Forest, large woody debris is very limited. The combination of flood flows and frequent landslides created huge volumes of trees and logs, in many channels, that later were removed as salvage timber.

Figure III-14. One example of an instream habitat improvement project is this log habitat structure in operation.

The Forest anadromous fish habitat improvement program emphasizes those elements of stream habitat that are most susceptible to degradation by man or nature. The focus of the program is on improving the quality and quantity of spawning habitat for adult salmon and steelhead, and rearing habitat for juveniles. The spawning habitat work is primarily directed to chinook salmon, which generally emigrate to the ocean or estuary by mid-summer. Juvenile steelhead are much more dependent upon stream habitat, commonly residing there for two or more years. The improvement work for steelhead emphasizes increasing the complexity of the rearing habitat.

The Forest has an active program directed to construction of in-stream structures to benefit salmonids through increased spawning and rearing habitat. The structure types include weirs to accumulate spawning gravels and various configurations of deflectors to provide rearing habitat. Construction materials have included boulders, logs, and gabions. Existing structures are evaluated annually for both effectiveness and maintenance needs. In-stream improvement will often be accompanied by riparian and up-slope restoration measures in the watershed. Extensive revegetation work is being done on the Forest in the watershed program to reduce erosion from landslides and failing stream banks. Watersheds that are severely degraded by sedimentation, such as Grouse Creek (South Fork Trinity River), must be stabilized before in-stream habitat work can be effective.

The Forest cooperates in a small-scale hatchery program that seeks to rebuild stream populations of native chinook salmon in tributaries within the Klamath-Trinity River basin. The objective of the program is to reestablish the population to a self-sustaining level. In Horse Linto Creek, a tributary of the Trinity River, the project has increased the native population of fall chinook salmon to a level such that the hatchery operation will cease after release of the 1993 brood of salmon in 1994. Monitoring of the spawning population over the next several years will be the ultimate measure of the success of the project. The facility has been operated by the Pacific Coast Restoration Group with funding from a tax on commercial salmon fishing.

Figure III-15. Another example of an instream habitat improvement project is this rock structure in operation.

The Karuk Tribe operates a small hatchery on Camp Creek, a tributary of the Klamath River. The facility utilizes native fall chinook trapped in the stream. The small size of the remnant population has limited the number of fish available for the hatchery. Bluff creek and Red Cap creeks were sites

for juvenile rearing facilities that annually released 60,000 to 110,000 fall chinook smolts. The juveniles were obtained from Irongate Hatchery on the upper Klamath River. Adult returns have been highly variable. The project last released salmon smolts in October, 1992. Future monitoring of the returning adults will determine if the project was successful in rebuilding the naturally spawning population using hatchery stock.

The Forest can provide high quality inland habitat for spawning and early rearing of anadromous fish, which depend on both freshwater and marine environments; however, survival and growth in the marine environment are obviously beyond the Forest purview. A long term management plan for the Klamath River was instituted in 1986 to control harvest and to rebuild the natural spawning population of fall chinook to optimum numbers. Drastic curtailments of both ocean and in-river harvest have not been successful to date in rebuilding the fall chinook population. The long term goal of rebuilding the population remains firm however, and the management agencies, commercial fishermen, and Indian tribes remain committed. (See discussion under Coordinated Restoration, below.)

Although the Forest emphasis is on anadromous fish habitat, resident trout streams with high angler usage or special characteristics will be evaluated for habitat improvement potential. An example would be a meadow habitat stream where the angling experience is enhanced by the natural beauty of the surrounding landscape.

The Forest has initiated a modest program of experimental habitat improvement for bass in Ruth Reservoir in cooperation with CDF&G and Humboldt Bay Municipal Water District. The habitat modification is currently being evaluated by the California Cooperative Fishery Unit at Humboldt State University. The results of this project are expected to yield data that will have broad application in northern California. Future habitat improvement at Ruth for bass depends on final analysis of the project data.

Coordinated Restoration Programs: Two major restoration programs for anadromous fish are ongoing in the Klamath-Trinity river basin. The Trinity program was authorized by Congress in 1984. The objective is to restore the anadromous fisheries of the Trinity River with an authorized expenditure of $62 million over a 10-year period. Major expenditures have included construction of a sediment control dam, modernization of the hatchery, biological assessment, watershed and habitat evaluation, fish habitat improvement, and watershed restoration. Through 1990, the Forest had expended approximately $300,000 of these funds for watershed and fish habitat projects on the Lower Trinity Ranger District.

The Klamath river restoration program was authorized by Congress in 1984 and programs a total of $42 million over a twenty-year period for restoration of the Klamath River anadromous fish resources. The federal share is limited to $21 million. The remainder must be from State or private sources. The Klamath program has two main thrusts. The first is to manage the harvest of Klamath river anadromous fish so as to rebuild the objective fish stocks. To this end, the Klamath Fishery Management Council, operating under the authority of the Pacific Fishery Management Council, has enacted stringent ocean and in-river harvest controls in order to rebuild the spawning escapement of Klamath-Trinity river basin fall-run chinook salmon.

The second authorized program is directed to restoration of the anadromous fish resources of the Klamath River (exclusive of the Trinity River basin) under direction of the Klamath River Basin Fisheries Task Force. This program began in 1986 and is primarily focused on long-term solutions to fish habitat problems. These include erosion, degraded habitat, and water diversions.

Cooperative organizations and agencies involved with the Klamath and Trinity programs include the U.S. Fish and Wildlife Service, National Marine Fisheries Service, CDF&G, U.S. Bureau of Reclamation, U.S. Soil Conservation Service, U.S. Forest Service, Hoopa, Yurok, and Karuk Indian Tribes, counties of Trinity, Humboldt, and Siskiyou, and commercial and sport-fishing representatives.

Affected Environment in Context with Alternatives.

The effects of the various alternatives on the fisheries resource are analyzed in chapter 4.

## SOCIAL AND ECONOMIC ENVIRONMENT

### SOCIAL

#### Public Issues

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plants and animal species?

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities?

Issue 17 What constitutes reasonable protection of Indian cultural activities and values?

Issue 36 How will the Forest balance the utilization of special forest products among culturally diverse publics?

#### Introduction

The social environment is a broad, loose term for all human individual and group interactions, such as the following: raising issues and concerns, actual behaviors, judgements, beliefs, values, morals, attitudes, perceptions, actions and reactions to the world around the individual or group concerned. Within such a broad context, it is necessary to narrow the focus and scope of the social environment to a manageable size. Therefore, this document will focus on the four social groups identified below, under “Method of Analysis.” The scope will be the primary zone of influence, as defined in the economic section and below.

In general, all issues and concerns have a social root or aspect to them. The natural world or the physical and biological environments (which includes the species Homo sapiens) in and of itself has neither a collective consciousness nor communicable voice to raise issues and concerns. Only

humans engage in these activities. The social dimension of all issues is recognized in discussions through this document.

Figure III-16. Gathering for the dedication of the Smith River National Recreation Area.

Basic Premises: It is necessary to make a few very general statements and set certain premises as a baseline, or as sideboards, in order to build a general and commonly understood framework for discussion and analysis in this document.

1. Humans are an integral part of the "environment, as referred to in NEPA. NEPA's mandate is to "create and maintain conditions under which man and nature can exist in productive harmony, and present and fulfill the social economic and other requirements of present and future generations of Americans." Section 101(a); 42 U.S.C. Section 4331.

2. Human kind is basically or inherently good and, if enlightened and given a choice, it will make reasonable and proper decisions.

3. Forest lands are not in some primeval, virgin, or fundamentally "natural," or undisturbed condition, due to past human activities and interaction for thousands of years and the suppression of wildfires for the last 50+ years.

4. The American people have an inherent and constitutional right to access the public lands in the pursuit of individual happiness.

5. No one social group is more acceptable or will receive preferential treatment or special considerations over any other social group, except as dictated by existing law, regulation, or treaty.

6. The social groupings used here represent the majority or middle ground of its members, not the extremes.

7. The term "conservation" in this section is that used by A. F. Gustafson and others in "Conservation in the United States" (Gustafson, et al; 1945, p 3): "As applied to natural resources the term conservation means the wise use of existing supplies, the husbanding of those that remain for the benefit of future generations, the restoration and careful management of the renewable resources, and the establishment of a workable program that will make them all serve the people as a whole, perpetually and to the fullest advantage."

8. Conservation, as used above, is dynamic, as ecosystems are dynamic. We will use the best current technology in the management, use, and restoration of ecosystems within their current capacity.

As stated in the Economic section of this chapter, the zone immediately surrounding Six Rivers National Forest is predominantly rural and highly dependent upon the Forest's natural resources for its social and economic well-being. These resources link the people and communities of this area to the Forest through employment, incomes, and environmental conditions which affect the lifestyles, population, and quality of life of the north coast region. Because of this, issues relating to nearly all aspects of Forest management are found to be the focus of social concern. Although no issues were

raised exclusively as social issues, there are three main issues which define the social climate: protection of the environment, stability of the economy, and continuance of traditional and contemporary Native American cultural activities and values. Balancing the utilization of special forest products among culturally diverse populations is a fourth issue that is beginning to emerge.

Affected Area: The Six Rivers National Forest is influenced by, and to some extent can influence, social and economic conditions at the regional and national levels. The area the Forest most affects, however, and that most affects the Forest is the area encompassing Del Norte, Humboldt, and Trinity counties in California. This will hereafter be referred to as the Forest's primary zone of influence. The Forest's secondary zone of influence takes in Curry County, Oregon, and, to a lesser extent, Siskiyou County, California. This five-county area is socially and economically tied to the physical and geographic location of Forest lands. The Forest's tertiary zone of influence includes the areas from Eureka, California, extending outward to the following communities: Gold Beach and Medford, Oregon; San Francisco, Sacramento, and Redding, California.

Diverse lifestyles and values are found in the primary zone of influence (see the section on Social Categories). Among these groups one thing is common: people see their lifestyles, and in some cases their identities, as being intrinsically linked to the land and its natural resources. This fact underlies their strongly held and sometimes widely divergent values.

Population Composition: Compared with the state of California, the region surrounding Six Rivers is racially homogeneous, with roughly 86 percent of the population being white (see Figure III-17).

The largest ethnic minority in the area is Native Americans, who make up roughly 42 percent of the region's minority population and are, for the most part, indigenous to the area (see Figure III-18).

Figure III-17.
Ethnic Diversity
Compared with California
From 1990 Census Data Asian Includes Pacific Islanders.

Figure III-18.
Breakdown of Ethnic Minorities
in Zone of Influences
from 1990 Census Data

African Americans are the fastest growing minority group in the area by percentage, but Hispanics have experienced the largest net population gain numerically, moving from four percent to five percent of the total population for the Forest's primary zone of influence. Growth within the Asian population is not as accurately measured since the 1980 census combined figures for Asians into a category with other races, while the 1990 census splits out figures for Asians from "Other." However, combined figures for Asian and "Other" races shows a net population gain of 19 percent for the Forest's zone of influence, compared with an increase of 103 percent statewide (see Figure III-17).

The population of the zone is chiefly clustered along major highways; for example, 80 percent of Humboldt County's population is located along US Highway 101 and the Humboldt Bay region (the Eureka-Arcata area surrounding Humboldt Bay). The Forest's primary zone of influence has a very low overall population density as compared to the remainder of the State (see the Economic section for a full description).

Method of Analysis

Groups of people who have the greatest potential to be affected by changing outputs, values and conditions on the Forest are described below. People within these social categories may be unified by any of the four following factors:

Shared socio-cultural identity, practices and interaction
Shared philosophical ideals and mores
Shared economic interests
Shared use emphasis

The following discussion will focus on how these shared traits translate into lifestyles and behaviors connected with the outputs and values from the Forest. Linkages between the socially-defined behaviors and outputs, values, and conditions from or on the Forest are also presented. Anticipated changes in the Forest's outputs, values, and conditions and the anticipated effects of these changes on people in the social categories, are analyzed in Chapter 4.

The social categories have been defined by delineating groups of people who share in any of the above factors; some of the groups may share in more than one of the factors (such as Native Americans, who often share cultural identity and practices as well as shared philosophical ideals and mores, or Commodity Dependent Residents who have earned a living in ranching and timber extraction but also hunted and/or hiked or recreated in the forest for the past few generations). The categories were defined using formal and informal interviews of Forest users, published and unpublished sociological and anthropological literature, newspaper articles, and census data. The categories are not mutually exclusive and are somewhat generalized for the purpose of comparing the various use perspectives. Individuals may identify with more than one of the groups, but it is expected that one of the factors listed above will take priority over the others in terms of the individual's identification with a particular category. Other groups may be characterized or subdivided from the categories; however, their perspectives relating to values and outputs of Forest most likely fit into those listed (with perhaps a varying degree of intensity). Those values, outputs, and conditions that are listed under each group are considered primary links to the Forest land base; in other words, they are the values or conditions that are of highest priority to the particular group. In most cases, the list should not be considered exhaustive. It should also be noted that various extremely polarized factions of the identified social groups are not addressed in this document; in most cases they represent more divergent views within their respective groups than between groups and cannot be dealt with in this analysis.

Amenity Emphasis: People in this category are unified mostly by common use interests on National Forest System (NFS) lands, though the uses are not necessarily economic uses. These are people who have either settled in or visit the area for the rural quality of life, the natural scenery, and the recreational opportunities. They may be "equity immigrants" (new residents moving from urban

areas), retirees, or destination recreationists. Some people in this category may be economically linked to forest amenities, if they own or are employed by a business that depends on fisheries or tourism as an economic base. They are not necessarily opposed to commodity extraction on NFS lands, but they may become concerned if it in some way conflicts with the availability of amenities they favor.

Following is a discussion of values, outputs, and conditions which people in this group are linked to:

Visual quality: Natural scenery is often what draws people in this group to the area. Visual evidence of intensive management has the potential to affect enjoyment of NFS lands for these users. They may not have an inherent disagreement with intensive management as long as it can be accomplished in a way that preserves high visual quality and natural scenery.

Recreational opportunity: This group values recreational opportunities ranging from fully-developed RV campsites to dispersed wilderness camping. They value conditions which allow for hunting, fishing, hiking, kayaking, and similar activities. This means that varied conditions are needed to support the varied lifestyles and recreational preferences within this group. For this reason, they may be concerned about road closures which affect access to certain areas, expansion of developed recreational facilities such as campgrounds, construction of trails for hiking, and development of off-highway vehicle opportunities. It is not uncommon for them to be concerned about competing recreational values on the Forest.

Fisheries: The anadromous fisheries supported by habitat on the Forest are an important resource to sport and commercial fishermen. Management practices which have the potential to adversely impact fisheries habitat to the extent that fish populations suffer decline are of concern to this group (Interview #I457, on file, Six Rivers Heritage Resources). Commercial fishermen are economically linked to fish populations released from NFS lands.

Interest in the amenity resources of the Forest is increasing as more people become aware of the possibilities for outdoor enjoyment. Improvements on Highways 101 and 299 have the potential to create greater accessibility of the Forest to people from urban areas and will likely increase visitor use. As local, tourism-dependent businesses spring up in the area, there will be increasing interest in developing amenity resources for the benefit of the local economy.

Environmental Priority: People in this category are unified primarily on philosophical lines, but there may be elements of socio-cultural identification in sub-groups as well. They are often formally or informally involved in organizations and clubs specifically geared to environmental protection, and their beliefs about land policies are often a unifying factor which extends beyond residence and occupation. As a result, they are often connected with a broad network of people who are highly committed to, and effective at, mobilizing local and regional resources to act on local environmental issues.

People in this group share a common conviction that the sustainability of life on the planet is dependent on healthy, functioning ecosystems (Interview #I451, on file, Six Rivers Heritage Resources). This forms the basis of their link to the Forest and their approach to resource management issues.

The ecosystems perspective embraced by this group holds that underlying the resources present on forest lands are processes and structures that work to sustain and renew those resources. Components like soil, climate, air, water, geological processes, and vegetation growth all work within an ordered system by natural processes and are interconnected with the process and with one another. They hold that disruption of these processes disturbs the balance of the functions and affects the overall health and viability of the ecosystem to support life and renew itself. Conditions such as air quality, water quality, and biodiversity are seen as indicators of a balanced, healthy, functioning ecosystem.

This group believes that disruption occurs through many avenues. They hold that intensive extraction of timber removes needed biomass and nutrients required to promote soil development and vegetational growth. They hold that road construction and clearcutting isolate populations of wildlife by interrupting the habitat, resulting in genetic in-breeding or decreases in breeding; these activities are major contributors to soils eroding into watersheds, which in turn affects fish populations. They hold that high-intensity broadcast burning overheats soils, and destroys their nutrient components, and burns ground vegetation needed to prevent mass erosion. They hold that interruption of the natural fire mosaic results in greater quantities of ground fuels, which can result in larger, more catastrophic wildfires, and in encroachment of some vegetation types into wider areas than where they naturally occur. Most people in this group feel that land management up until this time has utilized a fragmented, piecemeal-single resource-approach. They are not confident that the Forest Service has an understanding of the processes working in the forest environment; or they feel that if the agency does understand the processes, it is not reflected in the management practices that occur on the Forest.

For these reasons, people in this groups are seldom indifferent to any type of land use action on NFS Lands. Their concern is centered on the philosophies and strategies that form the basis of land management policy, and whether these reflect awareness and protection of the natural processes or pressure from political and economic interests.

People in the Environmental Priority group often express concerns for local forest conditions as part of their overall concern on a global scale. Increasing discussion of global warming, increasing incidences of environmental catastrophes such as oils spills, declining populations of wildlife, and continued toxic waste dumping have created urgent concerns and fears within this group about environmental problems and global survival (Interviews #I451, I452, I454 and I455; on file, Six Rivers Heritage Resources). Many feel that the degree of environmental degradation on the global scale has reached critical proportions and has the potential to irreversibly affect the sustainability of life on the planet. Because of this sense of urgent fear for the future, protection of environmental processes is the highest priority for this group. This is the salient fact behind their intense commitment and high motivation to effect change in land management policy: people in this group spend vast amounts of personal time and money to be involved in environmental issues.

Socio-cultural elements within this group include group identification based on shared philosophy, shared experiences, and a shared appreciation of natural values. Those who deal primarily with private timber companies in their environmental involvements also experience a shared sense of struggle against powerful adversaries (Interview #I452, on file, Six Rivers Heritage Resources), probably because the planning and decision-making processes employed by private companies, are for the most part, closed to public input until after a decision is submitted to the state.

As stated above, individual outputs, values, or uses represented in the Forest land base do not form the basis of links between this group and the Forest. Those conditions which are seen to indicate forest health and ecological sustainability are what connect this group to Six Rivers. This includes biodiversity and quality of water, air, and soil; the reasons for these links are found in the above discussion. Projects that are perceived to affect the ecosystem adversely are indicators of concern to this group. It should be noted that, with a few exceptions, Environmental Priority people have an inherent conflict with utilitarian functions on NFS lands unless ecological processes can be proven to be maintained before hand. Therefore, they feel that in order to sustain viability of ecosystem processes, timber harvest levels, mining, recreation, and road density must decrease sharply, or be banned.

Native Americans: Most of the Native Americans in the study area are descendants of the indigenous tribes that inhabited the area at the time of first white contact. Studies of these groups have occurred primarily as a result of their relationships with Heritage Resources that are managed on the forest.

This group is composed of several tribes with distinct languages, but who share many cultural elements. They are unified socio-culturally; they share a common sense of ethnic distinctness, heritage, and connection to the geographic location of their traditional homelands. This is reflected in the spiritual systems present in local Native American culture. Not only is there a sense of belonging to the area, but one of responsibility and stewardship. This is reflected in spiritual ceremonies such as the White Deerskin Dance, the Jump Dance, and First Salmon Ceremony (Winter and Heffner, 1979; Heffner, 1986). These ceremonies are conducted regularly to restore proper balance to the world. The continuance of traditional practices for them constitutes in a large part what it means to be a Native American and a good person.

This sense of geographic rootedness, responsibility, and stewardship needs to be considered as the context for Native American concerns with land management practices.

Many local Native Americans continue to gather materials that were traditionally used by their ancestors. Some of these materials are food: tanoak acorn, salmon, eel, steelhead, tanoak mushrooms, wild berries. Other materials are used for traditional cultural arts such as basketmaking (bear grass, hazel, willow, various ferns and roots); canoemaking (redwood), housebuilding (incense-or Port-Orford-cedar); bow and pipe making (Pacific yew) and regalia making (pileated woodpecker, marten, albino deer). The gathering of these materials often has a spiritual significance as well as a practical one, and reinforces the link between people, their environment, their Creator, and their identity (Nin-e-saan, 1985). The geographic ties to homeland are also inherent in gathering practices. Although many plants used by local Native Americans for basketry and food can be found in many areas of northern California, gatherers will often travel great distances to return to areas where they or their people have traditionally gathered (Heffner, personal communication, 8/6/91). Spiritual activities and management practices such as burning were means of ensuring ample supply of these materials and constituted part of the stewardship of their homeland. The availability and quality of materials traditionally used is of great concern to Native Americans.

Spiritual practices (religious ceremonies, doctor training, and so forth) are tied to certain geographic locations which are considered to be gateways to the spiritual world. Solitude, quiet, and high visual

quality are all needed as part of the experience; mature forest and the presence of other natural components that suggest continuity also contribute to the spiritual quality of an area. Intensive land management activities that are in close proximity to spiritual activity areas can have a significant effect on effective worship in a given area (Theodoratus et al., 1979; Winter et al., 1979).

Some Native Americans are employed in some aspect of timber extraction, and may identify as much with the Commodity dependent category in the economic sense as with the Native American in the socio-cultural. The extent to which these values are compatible or competing differs from individual to individual.

Below is a discussion of the values, outputs, and conditions represented on the Forest land base that Native Americans are linked to:

Spiritual use areas: Six Rivers has designated 11 Native American Contemporary Use Areas (NACUAs) in recognition of Native American values associated with them. A large portion of the Siskiyou Wilderness and a portion of the Trinity Alps Wilderness are also considered to have cultural/spiritual significance to contemporary Native Americans. Other spiritually significant locations lie outside these areas. Intensive land management practices in close proximity have the potential to affect spiritual uses in these areas.

Basketry and other plant resources: The supply and quality of materials needed for traditional basket-making, as well as plants and herbs used for medicinal purposes, is of great concern to this group. This includes but is not limited to bear grass, woodwardia fern, maidenhair fern, various tree roots, hazel, willow, wild tobacco, and angelica root. Plants such as bear grass and hazel require controlled burning to keep them in a usable state for basketmakers (Heffner, 1984). Other plants, such as woodwardia fern, grow better when “pruned” of dead material (Kathy McCovey, in an address to YCC crew, summer 1991). Herbs used for medicines need little to no management to make them usable. Management practices that can affect the supply and quality of these resources are not limited to burning, but also include site conversion, application of herbicides, and authorizing commercial plant gathering.

Currently a burn program is being pioneered on Orleans Ranger District to increase the availability of bear grass. Other burns, which would incorporate bear grass burning with other fuels management, are proposed for the other districts on the Forest. These are the only programs of this kind on the Forest at this time.

Tanoak community plants: Local Native Americans have commented on the decreasing availability of tanoak acorns, used as a traditional dietary staple, and a resource that is strongly associated with the identity of Native Americans. Conditions cited as causes include both insect blight and “site conversion”-the silvicultural practice of removing tanoak and other hardwoods from a stand and planting conifers in their place. Tanoak mushrooms grow beneath stands of tanoak and “bloom” in the autumn after warm rains. Availability of these mushrooms is affected by commercial and non-traditional harvesting. It is not known to what extent mushroom populations are affected by logging and site conversion; however, it is believed that certain gathering methods, such as raking the ground, have an adverse effect on succeeding mushroom populations.

The Forest has adopted a policy for commercial gathering of tanoak mushrooms which requires the purchase of a permit. Copies of this policy are available at Forest offices.

Grazing allotments: Some Native Americans have been involved in cattle grazing since the turn of the century, constituting a long term economic link with the land base. Policy which affects grazing allotments has the potential to have an economic effect on these individuals.

Pacific yew: Pacific yew has been the center of a recent controversy surrounding its use as a source for taxol, a compound shown to be effective in treating certain forms of cancer. Native Americans have traditionally used wood from yew to make bow staves and tobacco pipes, and it is used extensively in dance regalia made for spiritual ceremonies. There is concern over the protection of yew trees from impacts of logging and illegal extraction of bark for taxol.

Culturally significant wildlife: Pileated woodpecker, marten, and albino (or unusually colored) deer hides are all used in making dance regalia used in traditional festivals. Timber management which has the potential to change the characteristics of habitat that support populations of these species can affect their availability for Native American traditional uses.

Water quality: Water quality is of importance to local Native Americans as it affects potability as well as the ability for local rivers to support salmonid populations. Timber management practices that either have the potential to affect or are viewed as affecting water quality are of great concern. Practices of greatest concern include clearcutting and use of herbicides.

Timber: As stated above, some Native Americans are economically linked to timber outputs on Six Rivers. Declining harvest levels that affect employment among this group are of concern. Because of the socio-cultural ties to the area, few Native Americans have the desire to leave the area to find new jobs.

Fisheries: Salmon, steelhead, and eel formed a significant part of the traditional native diet. As with the acorn, there is strong association among local Native Americans to the salmonid fisheries, and the importance of the resource is reflected in their First Salmon Ceremonies. Declining fish populations are one of the greatest concerns to this group.

There is currently a resurgence of interest and participation in traditional lifeways and practices among young Native Americans (Nelson, 1978). Because of this, the conditions, outputs, and values linked with them as a social group are likely to increase in importance over time.

Tribal governments incorporate many of the aforementioned traditional concerns and have additional concerns that stem from a political aspect. Further study will be needed to determine to what extent tribal governments are affected by practices and policies on National Forest Lands.

Commodity dependent residents: This classification refers to people in occupations which rely primarily on forest outputs for their existence, namely loggers, ranchers, miners, and millworkers and their families.1/ This group also involves business owners and workers who acknowledge either a direct or indirect economic dependence on forest outputs. Sociologists in recent years have closely studied loggers and their social identity; less has been done with miners, ranchers, and millworkers as groups; none has been done with owners of mills and other

commodity-dependent businesses. Further research is planned to more fully recognize the perspectives of those who are indirectly dependent on commodity production. The information presented here about these groups is derived from published sociological data collected in Oregon, Washington, and California. At this time, the accuracy of this information in reflecting local social conditions has yet to be verified. An interviewing program is planned to accomplish this task, which will more closely study the use perspectives of this group and their links to commodities produced on NFS Lands.

1/ There may also be commodities besides those mentioned above that other groups are economically dependent upon. Economic dependence on non-timber commodities has not been studied to date.

According to published data, there are several similarities between these groups in terms of their economic dependence on timber outputs, but their social connection with Forest commodities has somewhat different emphases. All share a utilitarian perspective toward natural resources and see the utilization of forest commodities as both wise and necessary. On the whole, they are unified economically, though timber extraction workers and miners as sub-groups are also socio-culturally unified. This is discussed further below.

People directly involved in timber and mineral extraction have had a long tradition in the area, and timber extraction has historically been the dominant economic base. This has resulted in the evolution over time of an “occupational community” based upon timber extraction, which strongly unifies and defines people who work within it (Carroll and Lee, 1990). Families who comprise these occupational communities have often extended over several generations; however, newcomers have been assimilated into these communities as they get involved in timber extraction jobs. The types of ideals which characterize the world view of these people are hard work, courage in the face of danger (which is confronted daily, especially among fallers), rugged individualism, pride in skill, pride in the ability to provide for their families and community, and independent self- sufficiency. There is a strong desire to work in the forest as opposed to other types of employment. The occupation for these people forms the center around which most other social interactions occur, including networks for finding jobs, social and economic supports in hard times, and transfer and reinforcement of values (Carroll and Lee, 1990). This type of social group has made people very effective at their occupation, and has provided for strong cohesion in the community. Few, if any, will separate their personal identity from their professional one as a timber extraction worker, because so many social elements in their lives tie back into the occupation. For this reason, attempts to decrease the rate of timber harvest for environmental protection have often been viewed as a personal attack on their lifestyle, causing some in the community to portray those involved with timber extraction as “an endangered species.” A grass roots movement called “the wise use movement” began recently; it is a form of conservation ethic which also supports wise commodity production to balance the traditional conflict between utilitarian functions and preservational forces.

Those involved with secondary processing of timber products, such as millworkers, are not connected with their occupation in the same way that timber extraction workers are, but in general they have extensive social networks throughout the community as well. Where this is the case, it most probably results from having roots in the area which extend back several generations like many of the timber extraction workers. However, the main network seems to revolve around extended

family (Sommers and Birss, 1991). Qualities of value to these people include rural setting, low cost of living, and the presence of extended family and other long-standing social networks, in addition to pride in workmanship and skill in the workplace.

These groups are rooted to the area, but for different reasons: timber processing workers are drawn by family, tradition and/or quality of life, while the timber extraction worker is drawn to the occupation foremost, and the ability to work in the forest. For miners and ranchers the draw is self sufficiency and an outdoor way of life. While timber processing workers are more likely than timber extraction workers to be able to transfer their skills to other types of jobs, they are less likely to desire to move in order to follow economic opportunities. All three sub groups have a strongly local political and social outlook with regard to environmental and other issues; likewise, higher education among these three sub groups is notably uncommon, probably since the majority of jobs traditionally available in the area did not require it. The skills employed in timber-related occupations are often highly specialized, but generally are not acquired through secondary or higher education. (Carroll and Lee, 1990).

As indicated above, the outputs that people in this group are most linked to are timber, range, and minerals outputs. Declining timber harvest and land base have the potential to affect employment and economic opportunity for people in this group. Timber extraction workers in particular may be affected socio-culturally, because their social identity is rooted in the extraction of wood fiber. Likewise mineral withdrawals and restrictions on accessibility (decreasing road systems) affect this subgroup's ability to practice their traditional lifestyle.

It needs to be noted that Commodity Dependent residents have expressed no inherent conflict with environmental conservation as long as economic stability and security are assured, as the current "wise use movement" demonstrates.

Recent and Current Trends Affecting Social Conditions

The following social trends are currently affecting conditions in the primary zone of influence:

Reverse migration: Urban flight has caused a notable increase of retirees and immigrants from urban areas, such as Los Angeles, Sacramento, and the San Francisco Bay Area, who are taking advantage of lower property values to either purchase second homes or to relocate entirely. This is having a profound effect on real estate values and population. It has the potential to increase pressure to diversify the local economy, and to expand the demand for amenity resources on the Forest. These immigrants have been collectively referred to as the "new rural".

Continued and/or increased environmental concern: As media coverage of and political attention to environmental issues increase, the Forest can expect more expressions of concern about land management practices. Environmental Priority groups will continue to use the Endangered Species Act and other laws to press for protection of wildlife and other resources.

Increased political awareness and organization of Native American groups: In order to more effectively lobby for contemporary Native American concerns, local tribes are seeking and formalizing government to government relations with the Forest Service. These groups have become more sophisticated in their understanding of and participation in National Forest policy

making. Issues such as availability of culturally significant materials and protection of traditional and spiritual sites are likely to be the focus of concern as these groups experience increased participation in traditional practices and lifeways.

Continued and/or increased participation in grass root movements such as “the wise use movement” and bioregional planning groups: In order to defend their lifestyles and the integrity and stability of their local communities, commodity dependent people and local political leaders will become more involved in forest management issues. They will affect forest management decisions through involvement as important stakeholders and as planning partners at the bioregional level.

Opportunities

What these diverse groups seem to have in common is a value for small communities, an appreciation for the beauty of forest lands, and an ethic of stewardship for the land, although they vary considerably in their views of what “good stewardship” actually means (Fortmann et al., 1990). All value the quality of life in this north coast location and desire to see it maintained. Also common, however, is a burgeoning cynicism within the region concerning the Forest Service’s management policy: the growing view is that politics, not best management practices, are driving land management decisions (Lee, 1990). Dissatisfaction with the results of Forest Service decisions has resulted in the public’s increasing recourse to legal and political systems to regulate land management direction. The result is that the application of the National Environmental Policy Act planning process to land management decisions is becoming ever more critical, as the public increasingly avails itself of the need and the opportunity to get involved in the decision-making process.

In a national survey conducted in October 1994 by Frederick/Schneider, Inc. for American Forests, 1,000 randomly selected registered voters were polled to measure their attitudes toward forest management and forest health issues.

In general, the public has mixed views: they tend to believe that the nation’s forests are in reasonably good condition, and almost half are aware that the 1994 fire season was particularly severe. They tend to favor active management of forests, including fire salvage and thinning to improve forest health, rather than letting nature take its course. But they are closely divided on timber harvest issues, allowing logging in burned-over areas to be delayed by legal challenges, and the use of controlled fire.

Generally, the public has favorable attitudes towards agency responsible for forest management. As in other recent surveys, the Forest Service receives strongly positive ratings, as do state forest agencies, and environmental organizations (views are more mixed toward timber companies and the BLM).

Those who live in the west are more aware of current problems, and are more favorable toward timber harvesting and human management in forests.

The Forest Service is faced with the important challenge of establishing a greater degree of credibility with the public in regard to its land management decisions, as well as balancing NFMA planning with rapidly changing land policies. In addition, the Forest will need to find a way to

balance the various priorities of these groups in a way that fosters increased community cohesion. This will require the increased involvement of all parties in the solution-finding process, including people and groups who have not traditionally provided input to Forest planning and policy.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on the social environment are discussed in association with economic consequences in Chapter 4.

Figure III-20. This geology display at the Smith River National Recreation Area dedication is an example of the Six Rivers National Forest informing the public about Forest Service stewardship and management practices.

ECONOMIC ENVIRONMENT

Public Issues

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities?

Introduction

Six Rivers National Forest land management activities affect the social and economic well-being of communities close to and within the Forest boundaries. The Forest's primary zone of influence includes Humboldt, Del Norte, and Trinity counties. The Forest manages approximately 15 percent of the land base in Humboldt County, 60 percent in Del Norte County, and 10 percent in Trinity County. These counties are predominantly rural and to some extent depend upon the Forest's natural resources - timber, fish, wildlife, range, recreation, air and water quality, visual quality, and biodiversity. Forest outputs provide raw materials for local industries and influence expenditures by the population.

The Forest's extended zone of influence includes portions of Siskiyou County, California, and Curry County, Oregon. Users from this zone primarily include hunters, anglers, and recreationists. Employment is influenced to a small extent by Forest outputs. Siskiyou County receives one percent of the Forest's payments to the counties based on the approximately 9,800 acres of Forest land within the county.

Current Situation

Population: The population within the primary zone of influence is 155,641 (1990 Census data). Between 1980 and 1990 overall population increased by 12 percent with Del Norte County up 22 percent, Humboldt County up 9 percent, and Trinity County up 10 percent (see Figure III-21). Population growth in the region has been slow relative to that of the State (26 percent). Most of the population increase is attributable to immigration rather than natural increases (births minus deaths). The largest factors in this phenomenon are the immigration of retirees, urban flight by the "new rural" (see Social Environment), increases in government employment, and the expansion of Humboldt State University's enrollment. Population in the extended zone of influence is 218,499.

Compared to the State average of 190 people per square mile, population densities in these counties are low. The 1990 census indicates that 33 people per square mile live in Humboldt County, 24 in Del Norte County, and 4 in Trinity County.

The distribution of natural resources in the North Coast region has largely determined the settlement pattern and economic base of the area. In the primary zone of influence, 62 percent of the population lives in rural areas around the Forest or in small communities of 3,000 or less. People in these communities are most affected by timber management activities. Thirty-eight percent of the population lives in the major population centers along the coast near Humboldt Bay and Crescent City Harbor, with the highest concentration found in the Eureka/Arcata area.

Employment: The principal economic resources in the primary zone of influence include government employment (27 percent), wholesale and retail trade (23 percent), services (21 percent), and manufacturing (14 percent). Humboldt County exhibits similar levels of employment within these sectors, whereas Del Norte and Trinity counties have a larger percentage of government employment relative to the trade and services sectors (see Figure III-22).

Since 1972, employment trends within the primary zone of influence have been comparable to that of the State except for the government sector (Figures III-23 and III-24). Ninety percent of government employment in the area is state and local government and education. Increases in Humboldt State University enrollment and the opening of Pelican Bay State Prison in Crescent City contribute to higher than average employment in this sector.

Employment in the trade and services sectors has increased steadily since 1972. Employment in the trade sector is comparable to that of the state, while services sector employment is about five percent lower than the state average. Lower population densities and the predominantly self-sufficient lifestyles of residents may account for the lower employment rate in the service sector.

Employment in the manufacturing sector has been declining at both state and local levels. In the local area, manufacturing employment has dropped by more than 50 percent since 1972. Much of this decline is due to the declining timber industry and little diversification of the local manufacturing sector.

The forest products industry has historically dominated the North Coast economy since the 1850s. Forest products employment reached its highest level in the 1950s during the post-World War II housing boom. At its peak, the industry accounted for 34 percent of total regional employment and 90 percent of the manufacturing labor force.

The industry began a steady decline in production after 1959. Declining harvest levels on private lands, consolidation of small businesses into a few large holdings, and automation have resulted in declining employment levels. In 1990, the industry accounted for approximately 10 percent of total regional employment and 71 percent of the manufacturing labor force.

A recent economic study of Humboldt County (Economic Research Institute, HSU, 1989) estimated that 9.1 timber related jobs and 2.1 secondary or induced- employment jobs were associated with

each million board feet of timber harvested. Studies in the late 1970s estimated 8.3 to 9.7 jobs were affected for each million board feet in change of timber output.

Figure III-23.

Employment in the Primary Zone
of Influence

Percent of Total Employment
Sources: California EDD, Labor Market Information Division, Coastal and Northern Area Information Groups, June 1991.

Figure III-24.

Employment in the State

Percent of Total Employment
Sources: California EDD, Annual Planning Information Reports for Humboldt, Del Norte, and Trinity counties, and California, June 1990.

Harvest levels on the North Coast have stabilized since 1987 at an average of 1.1 billion board feet per year. It is predicted that this harvest level will be maintained over the next 10 to 15 years (Regional Timber Supply-Demand Situation in California, 1990; Appendix J). Timber supplies on the North Coast, however, are subject to increasing restrictions on the timber land base due to other resource concerns. Therefore, current forecasts of timber supplies are likely to undergo continued change in the future.

Income: In predominantly rural areas, income is usually lower than statewide averages due to the lifestyles of the residents. People tend to be more self-sufficient when it comes to the basic necessities of living. In remote areas people are more likely to raise their own food, gather fuelwood for heat, and perform for themselves many of the services available in the major population centers. Seasonal employment in industries such as timber, fisheries, agriculture, and tourism contributes to relatively high unemployment, which in turn reduces overall income levels. These factors account for some of the differences in income between the counties and the state. In 1989, local unemployment rates averaged 8.8 percent compared to the state's 5.1 percent. Del Norte County experienced the highest unemployment at 12.7 percent; Trinity and Humboldt counties, 12.3 and 7.9 percent, respectively.

Personal income in the primary zone of influence in 1989 totaled approximately $1.5 billion. Personal income includes wages, salaries, proprietor's income, and rents. Payrolls accounted for $1.01 billion. Eighty percent ($806 million) of payrolls was attributed to employment in the government, manufacturing, services, and wholesale and retail trade sectors (see Figure III-25). In the government and services sector, contributions to 1989 payrolls were comparable to the employment these sectors provide. The wholesale and retail trade sector accounted for 24 percent of employment but only 17 percent of payroll. The manufacturing sector accounted for 20 percent of 1989 payrolls based on 14 percent of total employment. The timber products industry, which includes logging, sawmills and planing mills, other wood products, and pulp and paper, accounted for 17 percent of total payroll and approximately 84 percent of the manufacturing payroll.

Figure III-25.

Source: California EDD, Labor Market Information Division, Coastal and Northern Area Information Groups, June 1991.
California EDD, Annual Planning Information Reports for Humboldt, Del Norte, and Trinity counties, June 1990

Per capita income within the primary zone of influence is approximately 30 percent lower than the State average (see Table III-21). The recession of the early 1980s played a major role in the decline in income for the region. The sharp drop in housing starts and subsequent declines in timber production had a severe effect on per capita income. By 1983, Humboldt, Del Norte, and Trinity counties experienced 13, 18, and 10 percent declines in per capita income, respectively. By 1987, per capita income in Del Norte and Humboldt counties was 14 and 6 percent lower, respectively, than 1979 levels. Per capita income in Trinity county surpassed 1979 levels by one-half percent.

Table III-21.
Per Capita Income
(Adjusted to 1987 Dollars)

| | | | | Percent Change |
|---|---|---|---|---|
| County | 1979 | 1983 | 1987 | 1979-1987 |
| Humboldt | 10,390 | 9,006 | 9,800 | - 6 |
| Del Norte | 9,480 | 7,776 | 8,147 | - 14 |
| Trinity | 9,492 | 8,543 | 9,526 | + 0.5 |
| State | 12,524 | 11,910 | 13,197 | + 5 |

Source: California Department of Finance. State Census Data Center, May 1990

Figure III-26.
Timber Harvest

Contribution of the Forest to the Local Economy: Management of the Forest affects the local economy in several ways:

By supplying outputs that stimulate private sector spending by firms and individuals.
By spending its budget for salaries and purchases in the local economy.
By receipt sharing, yield taxes, and payments in lieu of taxes to local counties.

Forest Outputs: The Forest provides a number of outputs that contribute to the health of the local economy. Timber has by far the largest economic impact within the primary zone of influence, followed by recreation, fisheries and wildlife, and range. In addition, gathering of miscellaneous Forest products has been increasing in recent years. Baseline outputs for the current situation represent average outputs for the three year period between 1988 and 1990.

The economic value of some Forest outputs can easily be quantified using market values or Forest usage fees. The value of timber, commercial fisheries, range, and to some extent recreation can be measured in this manner. Other uses, such as sport fisheries, hunting, and the majority of recreation must be assigned proxy values to determine economic value. Proxy values are theoretical estimates of what consumers would be willing to pay if active markets existed. The value of current Forest contributions to the local economy is expressed in terms of 1989 dollars.

Timber: Timber supplies from the Forest are an integral part of the local timber industry. Since 1954, National Forest timber has contributed between 3 and 19 percent of Humboldt, Del Norte, and Trinity counties' sawtimber harvest (see Figure III-26). In the 1950s and 1960s, Forest timber accounted for 4 and 10 percent, respectively, of total 3-county harvest. From 1970 to 1990, Forest timber contributed 13 to 15 percent to total harvest levels.

Declines in Forest timber sale volumes over the last 20 years (see Figure III-27) are mainly attributed to allocation of forest lands to other resource uses. The total Forest land base is 958,740 acres. At the present time 269,410 acres (28 percent) are capable, available, and tentatively suitable (see Timber Management section of this chapter) for timber management; 244,820 of those acres are considered suitable for timber production. Therefore, only 25 percent of the total Forest land base is available and suitable for timber production. Approximately 27 percent of the capable, available, and suitable lands (67,180 acres) are considered general forest where traditional harvest practices such as clearcutting can take place. The remaining 177,640 acres require selective harvesting to maintain visual quality and/or integrity of forest ecosystems.

Figure III-27.

Average Annual Timber Sold and Harvested

The Forest land base available for timber management has been reduced by a series of legal, administrative, and court decisions over the last 15 to 20 years. Harvesting is currently restricted on 689,060 acres, of which 98 percent is allocated to wilderness, wildlife, or recreation.

The 1984 California Wilderness Act created 123,150 acres of wilderness on the Forest. The 1990 Smith River National Recreation Area Act set aside another 140,520 acres. Together, these two Acts removed 28 percent of the Forest land base formerly available for timber management.

Protection of threatened, endangered, and sensitive species reduced the land base by an additional 240,910 acres (25 percent). The majority of the lands dedicated to wildlife are for protection of the northern spotted owl. In April of 1991, the U.S. Fish and Wildlife Service issued proposed critical habitat for the spotted owl which included approximately 340,000 acres of Forest lands. Forty percent of this critical habitat overlaps lands already set aside for other uses such as wilderness, recreation, and areas of special interest or concern.

The annual allowable sale quantity in the 1987 Draft Plan was 170 million board feet. From 1988 to 1990 the Forest sold an average of 120 million board feet annually. The value of this level of Forest timber was estimated at $30.9 million annually. Costs associated with administering the timber program (sale preparation and administration, site preparation, reforestation, timber stand improvement) were estimated at $11 million. Harvest levels in 1991 and 1992 dropped sharply; the Forest sold 10.5 million board feet in 1991, and 7.9 million board feet in 1992. This drop is mainly due to the listing of the northern spotted owl as a threatened species and the designation of the Smith River NRA.

Recreation: The Forest provides substantial opportunities for various forms of recreation (hunting, fishing, hiking, backpacking, picnicking, motorized recreation, camping, boating, swimming, skiing, and sightseeing). Recreational use of the Forest by local residents has a small effect on the local economy. At most, it represents a redistribution of expenditures from non-recreational to recreational consumer goods and services rather than infusion of new monies. Non-local recreationists account for approximately 15 to 20 percent of Forest recreation use, thereby contributing investment in the local economy from outside sources. Recreation use is currently estimated at 776,700 recreation visitor days valued at $16 million. The recreation program accounts for approximately $650,000 of the Forest budget.

Fisheries: The production of anadromous fish from watersheds on the Forest makes a major contribution to the commercial, sport, and Native American fisheries in northwestern California. Current populations of salmon are very low, a situation which has mandated severe limitations on harvest by all entities. The reduced harvest results in much lower economic values for this fishery in comparison to that potentially yielded from fully-seeded habitat. Steelhead make the largest contribution to the economies of local communities by virtue of relatively higher expenditures per fish by sport anglers in comparison to commercial fisheries. The economic benefit associated with on-Forest sport fishing in 1989 is estimated at $209,000. The economic benefits of off-Forest sport fishing and commercial harvest cannot be estimated given low population levels. The annual Forest fisheries program costs approximately $1.6 million, including cooperative funding received from State and Federal sources.

Range: Livestock production is the only form of agriculture directly related to the Forest; there is little farmland on the Forest. The range land in the Forest is used primarily for production of beef cattle, while the better pasture lands in the river valleys off the Forest are used for dairy cattle production. The Forest's grazing lands are estimated to account for less than two percent of the total beef production in Humboldt, Del Norte, and Trinity counties. The Forest provides approximately 6,575 AMs valued at $42,600. Range management activities cost the Forest approximately $121,000.

Miscellaneous Products: A growing industry on the Forest is the collection and selling of "Miscellaneous Forest Products." There is a wide variety of plants and materials being collected within the Forest boundaries by both the local and international communities. Examples of products collected include mushrooms, cones from different species of conifers, and ferns. Collectors sell these products to brokers who ship the products world-wide. The local economies benefit from these products by their collection and sale, with some local business people developing markets and brokering these products. This is a new industry, and the economic impacts to the local communities are largely unknown.

Forest Employment and Expenditures: The administration of the Forest impacts the local economy, especially in the small towns where the Ranger Districts are located (Gasquet, Orleans, Willow Creek, Mad River/Dinsmore). The Forest's operating costs in 1989 were about 18.7 million dollars, of which $17.1 million was budgeted; that is, appropriated by Congress. The remaining funds ($1.6 million) came from other federal and state agencies and were used for fire, wildlife and fisheries, and human resource programs. Approximately $11 million was spent on salaries and $4 million on contracts for goods and services. During the last decade permanent full time employment has ranged from 275 to 345 employees and averaged 310 employees per year. Temporary or

seasonal employment during the last 5 years has averaged 140 employees, the majority of whom were employed at Humboldt Nursery (since 1991 the nursery has let contracts for the performance of most of the work formerly done by temporary labor, reducing temporary employment by 80-90 percent).

The Forest also influences local employment through its human resource programs. In addition to the Young Adult Conservation Corps, the Forest has Memoranda of Agreement with Indian tribes and organizations for programs such as on-the-job training in resource management.

Payments to Counties: Local county revenues are directly affected by the level of National Forest outputs. Twenty-five percent of gross Forest receipts are returned to the counties, prorated on the basis of the acreage contained in each county. Currently, Del Norte county receives 42 percent; Humboldt, 34 percent; Trinity, 23 percent; and Siskiyou, 1 percent. These funds are earmarked for school districts and county roads.

Timber receipts make up approximately 99 percent of total Forest receipts; grazing and other use fees comprise the remainder. The value of the 25 percent fund is directly affected by both the amount of timber harvested from National Forest lands and the value of that timber. Receipts have historically tended to increase or decrease as harvest levels or timber values increase or decrease. Assuming that demand for timber products remains stable, increases and decreases in harvest level and timber values tend to balance each other in the long run. Declining timber supplies and lower harvest levels are offset by increasing values for timber; when timber supplies are readily available and harvest levels increase, timber values tend to decrease. The 25 percent fund rose from $1 million in the mid-1960s to $7.8 million in 1989 (see Figure III-28).

Figure III-28.

25% Payment to Counties

Since 1981, the fund has averaged 3.9 million dollars annually based on an average annual harvest of 138.3 million board feet (see Table III-22).

Since 1981, the fund has averaged 3.9 million dollars annually based on an average annual harvest of 138.3 million board feet (see Table III-22).

Table III-22.

Payments to Counties 1981-1990

| FY | Six Rivers' Harvest (Cut) (MMBF) | Gross Returns (MM $) | 25% Funds to Treasury (MM $) | to Counties (MM $) |
|---|---|---|---|---|
| 1981 | 114.4 | 15.2 | 3.8 | |
| 1982 | 57.9 | 5.6 | 1.4 | |
| 1983 | 126.9 | 11.3 | 2.8 | |

| | | | |
|---|---|---|---|
| 1984 | 136.0 | 14.8 | 3.7 |
| 1985 | 152.8 | 13.6 | 3.4 |
| 1986 | 136.0 | 16.8 | 4.2 |
| 1987 | 177.3 | 12.8 | 3.2 |
| 1988 | 200.1 | 21.6 | 5.3 |
| 1989 | 195.0 | 31.3 | 7.8 |
| 1990 | 86.7 | 18.5 | 4.6 |

Payments in Lieu of Taxes: Counties also receive revenue from in-lieu-of-tax fees (disbursed by the Bureau of Land Management) for each acre of Federal land contained in the county. The counties can use these payments for any governmental purpose. The current rate for Six Rivers National Forest land is 10 cents per acre.

Yield-Tax: Another timber-dependent county funding source is yield-tax revenue. Timber purchasers pay taxes on timber harvested to the California Franchise Tax Board; the Board allocates the proceeds back to the counties. Allocation of yield-tax revenues is based on the amount of timber harvested in a given county. Since 1980, the yield tax has ranged from $300,000 to $1,300,000 per year; the average yield tax for the period is $790,000 annually. The 1989 yield-tax rate was 2.9 percent.

Present Net Value: Present Net Value (PNV) is a measure of cost efficiency used by the Forest Service that provides one index for comparing alternatives. PNV is determined by deducting the cost of management activities from the value of Forest products and uses amenable to monetary quantification (commodities with established market values, like timber). PNV does not measure the value of non-quantifiable resources such as biodiversity, wildlife, and clean air and water. The values of the products or uses of the Forest such as timber, recreation, range, and minerals are calculated over the planning horizon of 16 decades. The investment and management costs incurred to produce these products and uses are also determined for the same time period. In order to show that a dollar today is worth more than a dollar will be tomorrow, a real interest rate of four percent is used to discount future values and costs so that they are comparable to the values and costs of the present time. The PNV for each alternative will be expressed in 1989 dollars according to Regional Office direction. For the Forest, the values of timber, recreation, fisheries, and range, as well as the budget for managing the Forest, are the primary determinants of PNV.

Opportunities

Several opportunities exist to contribute to the economic base of communities within the Forest's primary and extended zones of influence. These opportunities arise as a result of Forest management activities and the mix of outputs provided.

Commodity outputs such as timber, range, and minerals will continue to be produced on the Forest. These outputs provide raw materials for basic industries, as well as employment extracting, processing, and distributing products. Associated Forest investments in fuels treatment, reforestation, range improvements, and other activities generate both public and private sector employment via in-house and contract work. The incomes generated by these outputs and activities circulate through the local economy, generating indirect or induced employment and income in the other sectors.

Forest investment in recreation, fisheries, and wildlife present opportunities to increase contributions to the local economy from these non-commodity outputs over the next 10 years. Investment opportunities in these resource areas could lead to increased use of the Forest by recreationists, anglers, and hunters. Investment in developed and dispersed recreation on the Smith River NRA and elsewhere on the Forest has the potential to draw more visitors to the Forest. Watershed rehabilitation and fisheries habitat improvement projects are expected to increase the fisheries resource and subsequent commercial and sport fishing opportunities. Wildlife management activities provide opportunities to manage habitat for game species, and develop non-consumptive wildlife uses such as the Watchable Wildlife program. A new emphasis on ecosystem management and biodiversity may lead to greater investment in restoration and rehabilitation efforts in watersheds, riparian areas, and other areas and resources. Implementation of these programs provides employment in both the private and public sectors. In addition, continued investment in these management activities could draw more non-local users, thereby contributing outside investment to the local economy.

New programs are being developed to assist rural communities in diversifying their economies in order to help compensate for economic losses due to decreasing timber outputs. The Forest Service has begun a rural development program to help local communities and groups receive grants for businesses and projects. In addition, the U.S. Department of Agriculture created the Rural Development Agency (RDA) in 1991. This agency was established to strengthen the U.S. domestic economy and enhance the capacity of rural industries to compete worldwide by focusing exclusively on community and business programs. The RDA will respond to rural America's demands for growth. Typical programs include: providing assistance for water and waste disposal facilities in rural areas and towns of up to 10,000 people; making loans to develop community facilities for public use in rural areas and towns of not more than 20,000 people; and making business and industrial guaranteed loans in rural communities.

### Affected Environment in Context with Alternatives

Forest contribution to the economic base of local communities is a driving issue in the selection of one management alternative as the Forest Land and Resource Management Plan. The potential effects of the various management alternatives on the economic activity of local communities are discussed in association with the social consequences in Chapter 4.

## RESOURCE MANAGEMENT PROGRAMS

## RESEARCH NATURAL AREAS

### Public Issue

Issue 14 What areas will be recommended for establishment as Research Natural Areas?

### Introduction

Research Natural Areas (RNAs) on the National Forests are part of a national network of areas that, when complete, will identify and preserve a representative array of major North American

ecosystems. RNAs are designated by the Regional Forester for non-manipulative research, observation, and study and to contribute to maintaining biological diversity on National Forest System lands. RNAs are intended to serve as outdoor laboratories for students and researchers; they are not designed for general public recreation use. RNAs may also help to implement provisions of special acts, such as the Endangered Species Act, and the monitoring provisions of the National Forest Management Act.

Current Situation

The Forest Service has designed a national target system for the National Forests to assist in completing the national RNA network. Six Rivers National Forest lies within two physiographic provinces in this target system: the Klamath Mountains and the Coast Ranges (North). There are 19 target RNAs within the Klamath Mountain province and 17 within the Coast Ranges (North) province. These target RNAs are grouped into elements: forest, woodland, scrub and chaparral, grassland and meadow, marsh and bog, and special elements. In conjunction with the Klamath, Shasta-Trinity, and Mendocino National Forests, the Six Rivers is identifying RNAs on the Forest that will represent these target elements within the two provinces.

Eleven RNAs on the Six Rivers (total targeted) currently are being considered to help complete this network; inventory for the remaining target elements is in progress.

The process used to establish RNAs is as follows:

1. The Forest nominates candidate areas to meet the Region's targets.

2. The Forest, in conjunction with the Region, conducts preliminary screening of these candidate areas to determine basic acceptability (the type is represented in the area, accessibility is OK, and so on). The Golden Stairs, Rocky Knob, Doublegate, and Pine RNAs were eliminated from further consideration at this step.

3. In-depth ecological surveys of these candidate areas are conducted.

4. If the ecological surveys indicate, that the areas warrant RNA status, the areas are recommended to the Regional Forester for establishment. The proposed Pearch Creek RNA and the western half of the Hennessy Ridge RNA were eliminated from further consideration at this step.

5. The Forest Plan, or an amendment to the Forest Plan, serves as an establishment report for those areas that are recommended.

Figure III-29. Research Natural Area contains noteworthy examples of North American ecosystems, such as this darlingtonia bog type.

Table III-23.
Potential Research Natural Areas

| Nominated | Candidate | Ranger District | Acres | Ecosystem |
|---|---|---|---|---|

| | | | |
|---|---|---|---|
| Horse Linto | Lower Trinity | 1,000 | Aquatic |
| Three areas being evaluated* | Orleans/ Lower Trinity | 500-2,000 | Douglas-fir-tanoak-madrone |
| Two areas being evaluated* | Mad River | 1,000+ | Pacific Douglas-fir |

* One of these areas being evaluated will be nominated.

Recommended for establishment:

| | | | |
|---|---|---|---|
| Adorni | Orleans | 430 | Port-Orford-cedar |
| Craig's Creek | Smith River NRA | 1,150 | Knobcone pine |
| N. Trinity Mtn1 | Lower Trinity | 540 | White fir |
| Ruth | Mad River | 1,030 | Ponderosa pine/ Douglas-fir |
| L.E. Horton | Smith River NRA | 1,560 | Darlingtonia bog |
| Soldier | Mad River | 750 | Oregon white oak |
| Hennessy Ridge | Lower Trinity | 1,640 | Douglas-fir-tanoak-madrone |
| Upper Goose Cr. | Smith River NRA | 760 | Douglas-fir/western hemlock |

1 The North Trinity Mountain RNA is within the boundary of the Trinity Alps Wilderness.

Table III-23 displays the 11 areas on the Six Rivers National Forest currently nominated or recommended as Research Natural Areas. Descriptions and detailed maps of these areas are available in the Forest Supervisor's office.

The Yurok RNA has been established within the Yurok Experimental Forest to study old growth redwood. This RNA is managed by the Pacific Southwest Forest and Range Experiment Station.

Guidelines to ensure the integrity of the RNAs are not compromised will be detailed in management strategies for the areas. Components of the management strategies would include analysis of boundaries, and modification if necessary, a description of the ecological attributes of the area, accessibility, management concerns/conflicts (prevention of the spread of Port-Orford-cedar root disease), restoration needs (for example, the use of prescribed fire to restore that natural process to

the system), research and monitoring needs, and a timeline for completion of management actions. It should be emphasized that uses in existence prior to RNA establishment would be identified in the management strategy and an analysis made concerning the compatibility of a specific use with the area's RNA objectives. One example of an existing use is grazing. Grazing allotments either overlap with RNA boundaries or are proximal so as to have potential off-site effects (for example, North Trinity Mountain). Altering allotment boundaries to exclude portions within RNAs will be considered. Until such time that boundaries can be changed, interim measures to mitigate the effects of grazing would be employed; these would include identifying alternative water sources, placing salt blocks to alter travel patterns, and moving the cattle from areas during certain times of the year. Concurrently, management strategies would outline a monitoring plan to ascertain the effects of grazing on the resources of concern.

Opportunities

The eight recommended RNAs are allocated through the Forest Plan.These RNAs, as well as the three candidate RNAs (if established), would be managed according to the direction provided for the Research Natural Area Management Area (see description in Chapter IV of the Forest Plan). If any of the three candidate areas are not established as RNAs, the areas would be managed as portions of the management areas surrounding them. Until they are established or released, these areas will be managed to protect their research and educational values.

Opportunities would be identified in the management strategy prepared for each RNA. Restoration is a key area of development, especially with regard to restoring fire to the system and erosion control (the latter often due to ill-maintained roads). Marketing the RNAs to research and academic institutions through brochures and other forms of printed media, initializing infrastructural links for research (for example, campus computer or laboratory facilities) and publishing research papers are other areas for further development.

The schedule for developing management strategies is outlined in Chapter 5 of the Forest Plan. As is the case with most activities conducted by the Forest, implementation is dependent on the priority placed on RNA management assessment development, which can be defined in terms of the funding the RNA program receives.

Affected Environment in Context with Alternatives

The number and acreages of the 11 proposed research natural areas do not vary by alternative. Effects from establishment of the areas would be the same under all alternatives: timber is not available for harvest; new road construction is not allowed unless consistent with the objectives inherent in RNA management; recreational use discouraged; and possible recommendation for withdrawal from mineral entry, subject to valid existing rights. In light of the management direction and the protective measures to be outlined in the management assessments, the impacts to these areas are minimized. Therefore, consequences in regard to this issue would not vary among the management alternatives and are not analyzed further in Chapter 4.

SPECIAL INTEREST AREAS

Public Issue

Issue 15 How will Special Interest Areas be protected?

Current Situation

Special Interest Areas (SIAs) are designated to preserve and manage special areas within the National Forests. The Forest has identified the botanical, ecological, cultural, and geological interest areas shown in Table III-24.

The following sources were used to identify potential SIAs on the Six Rivers: input from Forest resource professionals, the California Native Plant Society, university faculty, botanists, California Department of Fish and Game (CDF&G) Natural Heritage Division, and a list of candidate National Natural Landmark (NNL) areas on the Forest identified by the National Park Service as part of the North Pacific Border Region NNL theme studies.

The Forest Service is participating with a consortium of federal and state agencies and private organizations operating in California to improve coordination in identifying, managing, and perpetuating California's natural areas. A Memorandum of Understanding supporting the establsihment of these areas was signed by the Regional Forester in April, 1989. Participating in California's Natural Area Program extends Regional direction "to identify areas with unique scenic, geological, botanical, zoological, paleontological, or other special characteristics, for potential classification as Special Interest Areas (SIAs)."

Table III-24.
Special Interest Areas

| NAME | DISTRICT | TYPE | ACRES | VALUE |
|---|---|---|---|---|
| Bear Basin Butte | Smith River NRA | Botanical | 8,760 | Conifer diversity |
| Broken Rib Mountain | Smith River NRA | Ecological | 7,140 | Ecological diversity |
| Myrtle Creek | Smith River NRA | Botanical/ Cultural | 1,950 | Ecological diversity Mining history |
| North Fork Smith River | Smith River NRA | Botanical | 31,330 | sensitive plants/ Serpentine plant communities |
| Horse Mountain | Lower Trinity | Botanical | 1,080 | Jeffrey pine woodland |
| The Lassics | Mad River | Botanical/ Geologic | 4,520 | sensitive plants/ Jeffrey pine woodland/Geology |

| | | | | |
|---|---|---|---|---|
| Bluff Creek | Orleans | Geologic | 25 | River geology |

Botanical Areas: Botanical areas are a type of Special Interest Area classified by the Regional Forester for protection of unique botanical values, for educational purposes, and for recreational use compatible with these values. The primary goal of the Botanical Area Program is to manage for the full complement of species and plant communities as well as the natural processes which support these elements. Six potential botanical or ecological areas have been identified on the Forest. These areas harbor unique assemblages of sensitive plants and plant communities. Some botanical areas also feature cultural and geologic highlights. The combination of attributes enhances the educational value of the areas. Forest visitors enjoy these areas for their wildflower displays, vistas, cultural aspects, and bird watching opportunities. Once botanical investigations are completed, management strategies would be written for each botanical area to address the specifics of area management (that is, trail location, information services, and so forth). To date only the Lassics and Horse Mountain Botanical Areas have completed botanical investigations.

The attributes of these areas are summarized below. Descriptions and detailed maps of the individual areas are available for review at the Forest Supervisor's Office in Eureka.

The Bear Basin Butte Area represents the enriched mixed conifer forest type which harbors forest communities of exceptional conifer diversity. Some of the 14 conifer species within the area are near or at the limit of their range, resulting in the unusual assemblage of many species that are normally more widespread. Brewer's spruce, Alaska yellow-cedar, Pacific yew, Port-Orford-cedar, western white pine, and mountain hemlock are some of the more distinctive species. The presence of mountain hemlock growing at elevations below which it normally occurs is particularly unique. One sensitive plant and six members of the California Native Plant Society's (CNPS) List 4 (species of limited distribution) are known to occur there. The Bear Basin Butte area encompasses the CDF&G's Bear Basin Significant Natural Area (DNT-001). The area also offers scenic views and is the site of an old homestead and a Forest Service lookout.

Figure III-31. Within the Lassics Botanical/Geologic Special Interest Area serpentine soil types create a stunted and denuded vegetative effect referred to as lunar landscape.

The Broken Rib Mountain Ecological Area is an ecologically diverse area composed of a variety of plant communities. This area includes Broken Rib Mountain. The southern border is adjacent to the Siskiyou Wilderness, which is in turn adjacent to the northeastern border of the Bear Basin Butte Botanical Area. The juxtaposition of these areas creates connectivity of the enriched mixed conifer forest across the landscape. The area offers sharp contrasts in plant communities as a result of different underlying parent material and the effects of wildfire. It contains extensive outcrops. Three former sensitive plants and one member of CNPS List 4 occur here.

The Myrtle Creek Area is a transition zone between the redwood and the mixed evergreen forests, containing species representative of both the coastal and interior environments. It contains areas with open and sparse forests dominated by knobcone pine, riparian woodlands, and some moist areas of mixed evergreen forest. Boggy areas support the California pitcher plant (Darlingtonia californica Torrey). One sensitive plant species and four former sensitive plants are known to occur in the area. The area contains remnants of its rich mining history.

The North Fork Smith River Area is one of the most botanically significant areas on the Forest due to the strong influence of soils derived from ultramafic parent material-soils of very low productivity. The area contains a high concentration of rare and endemic plant species which occur within various botanically diverse plant communities associated with the ultramafic (serpentine and peridotite) setting. Nine Forest Service sensitive species are known to occur here. Species considered rare in California (primarily CNPS list 4 species) are present throughout the botanical area. Noteworthy is the presence of rare plant-supporting serpentine barrens, Jeffrey pine woodlands located in areas of gentle topography, and Port-Orford-cedar communities associated with bogs, seeps, and streamsides. This area encompasses two of CDF&G's Significant Natural Areas and portions of three others.

The Horse Mountain Area contains generally harsh growing conditions supporting open forests with dense shrub cover and restricted tree growth. Three former sensitive plants which are currently CNPS List 4 species occur here. Of significance to this area from a conservation biology standpoint is the occurrence of Port-Orford-cedar at the southern-most limit of its range. According to research conducted on the genetic variation of Port-Orford-cedar, the Horse Mountain population was identified as distinct from other coastal populations in terms of containing unique genetic material (Miller and Marshall, 1990). This Area includes the southern portion of CDF&G's Indian Butte Significant Natural Area (HUM-010). The Horse Mountain communications site occupies a portion of the area. Remnants of mining activity are visible in the area.

The Lassics Area is a high elevation area that supports many unique habitats and associated plant communities. (See "Geologic Interest Areas" below). Open Jeffrey pine woodlands, montane chapparal, and rocky substrates define the mosaic of vegetation in the area. Distinctive geology contributes to the interesting flora here. Rare and endemic plants in the area include six Forest Service-listed sensitive species and many plant species that have a limited distribution and are endemic to the local serpentine soils. The Lassics area encompasses a majority of CDF&G's Lassics Significant Natural Area (TRI-003).

Figure III-32. Black Lassic Peak above Jeffrey pine and white fir woodlands within the Lassics Botanical/Geologic Special Interest Area.

The management direction for botanical areas provides for recreational opportunities while ensuring the maintenance of the botanical attributes. Current recreational use is in the form of nature study, sight-seeing, cross-country skiing in the Lassics and Horse Mountain, off-highway vehicle use, hunting, and camping.

Mining is a potential activity that can affect the resources of the botanical areas. The authority for mineral development predates the designation of Botanical Areas (1872 Mining Act, as amended). The North Fork Smith Botanical Area has been subject to mining activities since the early 1900s. The Smith River National Recreation Area Act prohibits new mining claims and patents and makes all operations subject to valid existing rights. A claim, to have valid existing rights, must have had a valuable mineral deposit as of the date of the NRA Act; that is, it must have been marketable and profitable to mine. The mineral development potential for this area is low (see "Minerals" section). The Lassics Botanical Area has a moderate to high mineral development potential. No claims have been filed in that area in the last 20 years. Horse Mountain Botanical Area has a high mineral

development potential. Current claims exist in the southern portion of this area, but no operating plans have been filed in recent years.

A proposed standard and guideline for botanical areas would require evaluation of the areas for recommendation for withdrawal from mineral entry, with the exception of those areas in the Smith River NRA which are withdrawn under the establishing legislation. The Secretary of the Interior has authority to withdraw lands from mineral entry based upon resource conflicts and mineral development potential. Meanwhile, any mining that occurs is subject to NEPA documentation and the application of appropriate mitigation measures.

All recreational uses (OHV use, cross-country hiking, mountain biking, hoseback riding, etc.) have the potential to impact the integrity of the botanical area by removal of vegetation (fuel for camp fires, plant collectors), soil compaction, and soil erosion and introduction of non-native species. Illegal OHV use (specifically cross-country) has been documented in the serpentine barrens and wetlands of the Lassics Botanical Area (Wunner, 1991, personal observation). Because of its open, gently sloping terrain, the Lassics Botanical Area is particularly vulnerable to cross-country travel. The terrain of most of the other botanical areas is such that cross-country travel would not be an issue, with the exception of localized sites of flat topography and little vegetative cover. Examples of these sites include areas in the vicinity of High Plateau Mountain, and Wimer and Diamond Creek roads in the North Fork of the Smith River Botanical Area.

Currently passenger vehicles are permitted on maintenance level 3 roads and above; OHVs are permitted on all level 2 roads (not maintained for passenger vehicle travel) and designated OHV routes. Level 2 and 3 roads are present in all of the botanical areas. Vehicular access for both the public and Forest Service personnel is a concern within the Port-Orford-cedar range due to the potential spread of Port-Orford-cedar root disease into uninfected drainages. Although non-vehicular sources (pedestrians, animals) can spread the disease, vehicles travel greater distances and potentially run a greater risk of contacting infected waters as compared to non-vehicular sources. Infection of more tributaries by the root disease would result in a loss of diversity in those botanical areas which support Port-Orford-cedar. Port-Orford-cedar communities, particularly in the North Fork of the Smith, contribute to the great diversity of the area. The cedar stands appear to support the highest species richness of all the primary vegetation series found in northwest California (Jimerson and Creasy, 1992). Port-Orford-cedar is present in the North Fork of the Smith, Myrtle Creek, and Bear Basin. It reaches its southern limit in the Horse Mountain Botanical Area.

The issue of access in all botanical areas will be specifically addressed in the area management stratagies; Until such time as the stratagies are written, access with the potential to cause resource damage will be reviewed on a case-by-case basis. Of particular concern are the unmaintained mining roads that were constructed many years ago which have since failed, thus increasing road-related runoff with the subsequent development of gullies downslope. Roads dissecting creeks which are to date uninfected with Port-Orford-cedar root disease are also of concern. Protective options include signing, restoration, closure, and obliteration.

Two grazing allotments overlap with the Lassics Botanical Area. A survey conducted in 1990 identified resource damage in the form of grazing and trampling on the edge of vernal ponds and in meadows (Wunner, 1991). Exclusion of cattle by changing allotment boundaries is under

consideration. Interim measures to reduce the effect of cattle include fencing the wetlands, placement of salt blocks to alter travel patterns, and identification of alternative water sources.

Geologic Interest Areas: The complex geologic history of the Forest has produced an equally complex distribution of interesting geologic materials and features, including bedrock structures and landforms. Two areas of particular geologic interest are the Lassics area (part of a proposed botanical area) and the lower section of Bluff Creek.

The Lassics comprise three prominent peaks located on the Mad River Ranger District. Black Lassic, Red Lassic, and Mt. Lassic (Signal Peak) are all about 5,900 feet in elevation, which is several hundred feet above the surrounding terrain. These peaks are unusual because each is composed of different geologic materials. Although it appears to be an extinct volcano, Black Lassic is a fragment of black mudstone and sandstone, probably displaced from the Great Valley Sequence that outcrops about 80 miles to the east; Red Lassic is an “exotic block” of altered, reddish pillow basalt and chert; and Mt. Lassic is composed of grayish siltstone, slate, graywacke, and chert. This area appears to be a remnant of the ancient Coast Range Thrust Fault (see below) which may extend from southern Oregon to southern California. The unusual “lunar landscape” appearance of the area has resulted from the weathering of the surrounding bedrock (serpentinized peridotite), which produces a denuded or sparsely vegetated, boulder-strewn surface.

The Bluff Creek Geologic Interest Area is located on the Orleans Ranger District where Bluff Creek joins the Klamath River along Highway 96. This site provides an impressive display of the powerful erosiveness of running water. During the flood of December 1964, Bluff Creek abandoned the lower mile of its former channel by cutting through a narrow bedrock ridge separating it from the Klamath River. This produced a gorge about 200 feet deep, eroding over a million cubic yards of material in a matter of hours. The nickpoint or step that resulted from this abrupt downcutting has propagated upstream for several miles in the intervening years and will have far-reaching, long-term effects on the lower parts of this drainage and the stability of adjacent slopes.

Other areas of geologic interest include:

Surface trace of the Coast Range Fault: This ancient, inactive fault is exposed from southern Oregon across the entire length of the Six Rivers to the Yolla Bolly area. It probably extends further south beneath younger surface rocks. This major fault marks the contact between the Franciscan rocks and older metamorphic rocks of the Klamath Mountains, and is a significant remnant of the plate tectonic history of northern California. It is a broad zone of sheared rocks, especially serpentine, through much of its exposed length.

Giant Landslide Features: There are numerous large landslide features on the Forest, both ancient and more recent. Many can only be viewed on airphoto stereo pairs. A few are well suited for viewing and study in the field, however, due to a suitable vantage point and sparse vegetation. Some have remained active into the present, and most are complex slope failures. The following selection of large landslides includes ones that have greatly affected the terrain of the Forest:

Rattlesnake Slide: Smith River NRA, South Fork Smith River, across County Road 427; lower part recently active, upper part intermittently active.

Muslatt Slide:  Smith River NRA, South Fork Smith River; probably inactive.

Fish Lake Slide:  Orleans, west side of Bluff Creek; active lower section.

Devastation Slide:  Lower Trinity, lower Grouse Creek; bottom third active in most years.

Mule Slide:  Mad River, south side of Mule Ridge; probably inactive.

Dobbyn Slide:  Mad River, near Coffee Pot; intermittently active.

Lassics Earthflow:  Mad River, east of Lassics; probably inactive.

Elevated Stream Terraces Near Fox Ridge, Smith River National Recreation Area:  Remnant stream terraces are an important indicator for the history of geologic uplift in an area.  There are at least four distinct, relatively intact stream terraces on the east side of lower Hurdygurdy Creek and the west side of Jones Creek which are tributaries to the South Fork Smith River.  These features indicate that Fox Ridge, which lies between them, has been uplifted in at least four separate pulses over an indeterminate period of time.  As a result, the two streams have been progressively displaced to the west and east, respectively, away from Fox Ridge.  This is an interesting geologic feature that can be viewed from Road 15N01 or from the county roads that cross the terrace surfaces.

Exposures of Distinctive Geologic Materials:
Laterites of Gasquet Mountain:  These intensely weathered and leached laterite soils that have developed on the Josephine peridotite of northwest California and southwest Oregon are essentially unique in the continental United States.

Bedded chert exposures, west side of Ruth Reservoir:  These are interesting and picturesque for the layman, as well as having scientific interest, indicating a deep, oceanic environment.

Indian Rocks Area, Orleans Ranger District:  This unusual and scenic rock formation is located along the National Scenic Recreation Trail on the ridge between the Klamath and Salmon River drainages.  It consists of columnar spires up to 60 feet high, perched on a scenic overlook at about 6,000' elevation.

Exotic blocks in Franciscan terrane, Mad River District:  Several geologically unusual rock types occur as isolated “knockers” in Franciscan melange belts.  These include folded ribbon chert, eclogite (interpreted as a fragment of the earth’s mantle which underlies the crust), glaucophane schist (a rare high-pressure, low temperature metamorphic rock), and pillow basalt (lava emplaced underwater).  Most are of unusual appearance and color and may be considered picturesque.

National Natural Landmarks:  The U.S. Department of Interior, National Park Service (NPS), has identified, as part of the North Pacific Border Region NNL theme studies, six candidate National Natural Landmark (NNL) areas which are either partly or wholly on the Forest.  Some of these are listed above.  The Regional Forester can recommend to the Park Service that particular areas be included in the NNL system.  National Natural Landmarks are areas which represent the geological or ecological character of the United States.  These areas should be high quality examples of the geological or ecological features of the geographic region in which they occur.  If designated, the

features will be managed to protect their integrity from alteration. No other management restrictions are placed on the sites under the multiple-use concept.

The NNLs under consideration here are described briefly below. Acreages given are for the entire NNL area including sections on this Forest. Further information and maps can be found in the planning records at the Forest Supervisor's Office in Eureka, CA.

Siskiyou Mountains (200,000 acres): NPS Themes represented: mountain system, land sculpture, glacial action, streams, lakes and ponds, Boreal forest, Pacific forest, dry coniferous forest, chaparral, special ecosystems. The values for which this area was nominated are now adequately represented within the Siskiyou Wilderness and will be fully protected by that designation. Potential for NNL designation will be assessed in more detail when the Siskiyou Wilderness Implementation Schedule is developed.

Trinity Alps (490,400 acres): NPS Themes represented: mountain system, land sculpture, glacial action, streams, lakes and ponds, dry coniferous forest, chaparral, grassland. The values for which this area was nominated are now adequately represented within the Trinity Alps Wilderness and will be fully protected by that designation. Potential for NNL designation will be assessed in more detail when the Trinity Alps Wilderness management plan is developed.

Yolla Bolly Mountains (148,100 acres): NPS Themes represented: mountain system, land sculpture, significant fossil remains, streams, Boreal forest, Pacific forest, dry coniferous forest, chaparral. The values for which this area was nominated are now adequately represented within the Yolla Bolly-Middle Eel Wilderness and will be fully protected by that designation. Potential for NNL designation will be assessed in more detail when the wilderness implementation schedule is completed.

The Lassics (3,640 acres): NPS Themes represented: geologic history, landform sculpture, Boreal forest, dry coniferous forest, chaparral, desert (barrens). The NPS proposal for the Lassics includes Red Mountain and the Senteney Rock area and the Lassics peaks. The proposed Forest botanical area encompasses the Lassics peaks, part of Mule Slide, and the serpentine area west of the Lassics lookout. The Forest did not include Red Mountain and the corridor to it in its proposal because the private land on Red Mountain has been greatly altered. The corridor to Red Mountain past Senteney Rock also contains key summer deer range that probably would be burned frequently to maintain its forage value. This wildlife habitat manipulation was thought to conflict with botanical area management and was not included in the Forest's proposal. That part of the Lassics within the proposed botanical area is suitable for NNL designation and would be considered for designation if this area is established as a botanical area.

Stony Creek Bog (1,400 acres): NPS Themes represented: special ecosystem (Darlingtonia bog). The NPS proposal includes both the private land along Stony Creek that contains the bog and about 1,200 acres of National Forest land to the east. Essentially all the unique botanical values are contained in the bogs on private land, so the Forest did not propose to designate the part on National Forest System land. The private land would be a good candidate for acquisition as a botanical area. The State currently owns 120 acres adjacent to the bog and is attempting to purchase the bog itself. Therefore, the Forest does not recommend NNL designation for that portion of the NPS proposal on National Forest System land.

Bear Basin Butte (8,764 acres): NPS themes represented: landform sculpture, glacial action, Boreal forest, chaparral. See Bear Basin Butte above.

Significant Natural Areas of California: These areas are included in the Natural Diversity Data Base kept by CDF&G's Land and Natural Area Program. Those listed in Table III-25 exclude those mentioned in the Botanical Area discussion above.

Table III-25.
California Department of Fish and Game
Significant Natural Areas of California

| Identification | | Significance |
|---|---|---|
| Pine Flat Mountain | (DNT-004) | Occurrences of Waldo buckwheat, McDonald's rock cress (Fed & state endangered), Waldo rock cress, Yellow-tubered toothwort, Howell's jewelflower (Fed cat. 2). |
| Smith River | (DNT-005) | Occurrences of Klamath spring/summer run Chinook salmon and steelhead trout. |
| Headwaters of Copper Ck | (DNT-006) | Occurrences of Waldo buckwheat, McDonald's rock cress (Fed & state endangered), Yellow-tubered toothwort, Howell's jewelflower (Fed Cat. 2). |
| Hole-in-the-Ground | (DNT-012) | Occurrences of McDonald's rock cress (Fed & state endangered). |
| High Plateau Mountain | (DNT-013) | Occurrences of Waldo buckwheat, McDonald's rock cress (Fed & state endangered), Howell's jewelflower (Fed Cat. 2). |
| Upper Van Duzen River | (HUM-006) | Occurrences of Coastal spring/summer run steelhead trout. |
| Big Bend of Mad River | (HUM-008) | Upland Douglas-fir forest. |
| Indian Butte | (HUM-010) | Upland Douglas-fir forest. |
| Red Cap Creek | (HUM-022) | Occurrences of Klamath spring/summer run steelhead trout, pacific fisher. |
| Camp Creek | (HUM-023) | Occurrences of Klamath spring/summer run steelhead trout, Karok Indian snail. |
| Cedar Grove Ranch | (HUM-013) | Bald eagle, Special Animal (classified information), Pacific fisher. |

Opportunities

Botanical Areas: Botanical areas are currently being managed with consideration for their botanical values, yet more specific direction in the form of management strategies is needed. Management stratagy development would begin after the completion of botanical investigations of the areas. Botanical investigations involve thorough inventories and mapping of rare plant occurrences and plant communities; validation of boundary integrity; and identification of management concerns and opportunities. Areas experiencing the most resource impact and development pressure will receive priority. Another factor entering into the prioritization is the availability of a work force and/or funds to implement the investigation. Opportunities do exist to utilize volunteers. Once investigations are completed, stratagies will be developed to provide site specific guidance such as location of trails and signing, road closures, restoration projects, and monitoring.

Interpretive opportunities would also be identified as part of the management plan. Recently a self-guided nature trail with brochure was developed for the Myrtle Creek Botanical/Cultural Area. Through a cost-share agreement with the Garden Club of America another brochure was developed describing the primary features of all the botanical areas on the Forest. Interpretive opportunities would not only enhance the public's enjoyment of these areas but would serve to educate people about which activities are permissible in botanical areas.

Cooperative efforts to study, preserve, and restore plant communities, sensitive plants, and plant habitat are available between the Forest Service and other organizations and agencies. The Regional Forester has provided a forum for coordination through Memorandums of Understanding (MOU) with organizations such as the California Native Plant Society, The Nature Conservancy, The California Diversity Data Base, Rancho Santa Ana Botanic Garden, and the Garden Club of America. Surveys, monitoring, and botanical investigations are examples of cooperative opportunities available under the MOUs.

To date the Forest supports a combination of botanical, ecological, geological, and cultural areas. Opportunities exist to identify additional areas of like emphasis as well as areas highlighting other features; for example, zoological areas.

Affected Environment in Context with Alternatives

The number, acreages, and management emphasis of three of the four botanical areas within the Smith River Recreational Area and the Bluff Creek Geologic Interest Area do not vary by alternative and will not be discussed further in Chapter 4. The environmental consequences for the Lassics, North Fork Smith River, and Horse Mountain Botanical Areas do vary by alternative and will be discussed further in Chapter 4.

HUMBOLDT NURSERY

Public Issues

The management of the Humboldt Nursery was not identified as an issue or concern in the public input process. However, it is anticipated that concerns may develop during the planning period about the supply of conifers and hardwoods for maintaining vegetative diversity on the Forest.

## Introduction

Humboldt Nursery is a unique and highly specialized environment. It is situated by the Pacific Ocean on Dow's Prairie, about 15 miles north of Eureka, in the community of McKinleyville. Relatively isolated from the Forest proper, the Nursery is a 200-acre fragment of the National Forest System that makes a major contribution. Millions of tree seedlings are grown and cultured every year for the reforestation of the Pacific Northwest and California.

The Nursery provides stock for regenerating harvested and burned areas, rehabilitating watersheds and riparian communities, and restoring rare and sensitive plant associations throughout the region. Within its Regional role, as a working part of the Six Rivers National Forest, the Nursery responds to the list of issues confronting the Forest Service locally as well as regionally. It is a key player in the effort to conserve the vegetative component of biodiversity on the Forest.

## Current Situation

The Nursery, since it opened in 1962, has produced nearly 250,000,000 seedlings. The largest component of the annual crop is Douglas-fir, the most prolific large conifer on the Forest and throughout the region. The Nursery also produces a wide variety of conifers representing many of the major plant communities of the western half of the Pacific Northwest and northern California. Included are red fir, Shasta red fir, white fir, noble fir, Pacific silver fir, and grand fir (known collectively as "true" firs, to distinguish them from Douglas-fir); western red cedar, incense-cedar and Port-Orford-cedar; Sitka spruce, Englemann spruce, and Brewer, or "weeping," spruce; ponderosa pine, Jeffrey pine, sugar pine, western white pine, knobcone pine, and lodgepole pine; western hemlock and mountain hemlock; and redwood. The Nursery is presently experimenting with giant sequoia and the rare Torrey pine.

The Nursery, in recent years evolving to become a primary source for the integrated forestry techniques and ecosystem management principles of the immediate future, has begun to add more non-commercial species to its inventory. It has cultivated red and white alder on a production scale for over a decade. It also cultivates digger pine, big leaf maple, tanoak, Brewer oak, and Oregon white oak; woody shrubs such as California redbud, coast coffeeberry, buckbrush ceanothus, and blue blossom (wild lilac); and experimental plots of Pacific yew, cottonwood, and various willows grown from cuttings.

The Nursery is technically a "bare root conifer" nursery; meaning that conifers, or cone and needle bearing evergreen trees, are either grown in the field directly from seed or transplanted into the field from greenhouse beginnings. The Nursery has actually become a more versatile operation. The Nursery, by learning to grow and culture hardwoods, will be able to supply the restoration and regeneration needs of the Forest and region in a manner which maintains vegetative diversity. Hardwoods such as tanoak are an integral component of stands on much of the Six Rivers, and hardwoods in general thrive along the northwest coast and coastal ranges from California through Oregon.

The Nursery's historic purpose will remain paramount, although it is entering what promises to be a new era in national forest management. Between 500,000 to 1,000,000 acres of Federal and State public lands have been reforested with trees from Humboldt Nursery. In addition to Six Rivers NF, the Nursery serves Klamath, Mendocino, Modoc, Eldorado, Plumas, Sierra, Shasta-Trinity, Stanislaus, Tahoe, and Sequoia National Forests in California; Olympic, Rogue River, Siskiyou, Siuslaw, Umpqua, and Willamette National Forests in Washington and Oregon; the Eugene, Roseburg, Coos Bay, Medford, and Salem BLM districts in Oregon; the Redding and Ukiah BLM districts in California; and Redwood National Park. The Federal Bureau of Indian Affairs and State agencies like the Oregon Dept. of Forestry have used seedlings grown at the Nursery, and the California Conservation Corps regularly grows alder there for use in streamside erosion control and bank stabilization.

The Nursery maintains a research group, the Diverse Species Group, to conduct ongoing experimentation and data collection involving reproduction, artificial propagation, culturing, storing, and outplanting an array of tree species, both traditional and non-traditional. Oversight is provided by the Pacific Southwest Forest and Range Experimental Station in Albany, California. This unit has been instrumental over the last 20 years in developing many guidelines and practices that are now standard for the nursery production of Douglas-fir and some true firs. They have on-site lab and greenhouse facilities, but more importantly they have the experience and know-how to help lead the effort to expand the Nursery's species catalog. They are currently working with Pacific yew, cottonwood, various willows, and big leaf maple.

Seed selected to grow nursery seedlings is certified by the Forest Service to be seed of the same genotypes naturally occurring at the reforestation site. Seed is collected from mature trees in a number of stands from the same breeding zone and elevation belt. When areas are reforested, maintaining integrity of genotypes helps to assure both a successful regeneration and the inherent genetic variability of local populations. Indiscriminate tree planting without regard for species composition and genotype integrity can have detrimental effects on an ecosystem.

When replanting stands that have had an intermediate harvest or have been regenerated with a green tree retention, larger, hardier seedlings are needed than are customarily required for replanting a clearcut patch. The Nursery has 30 years experience growing very large two-year old seedlings for Forests such as Siuslaw NF in central coastal Oregon, where competition for light and available moisture between seedlings and thick brush presents a major regeneration problem. The Nursery specializes in culturing seedlings (growing to dimensional specifications) to suit a Forest's or district's particular and often unique needs. For instance the larger trees must have a corresponding root mass to support and sustain them. Studies undertaken at the Nursery over the last 20 years pioneered in the field of root growth and formation, concluding that root development is the single most decisive factor in determining seedling failure or success. Knowledge gained about root growth capacity and root to shoot (stem) ratios enables the Nursery to prescribe cultural treatments to attain the desired product in the same way that silviculturists prescribe stand management treatments.

Opportunities

As Six Rivers and other Forests move toward developing management prescriptions of all kinds from an ecosystem perspective, Humboldt Nursery will be able to produce the seedlings that will make the new prescriptions work.

The great opportunity awaiting the Nursery is the chance to participate, as a working contributor, in the reforestation and maintenance of ecosystems throughout northern California, the Sierra Nevada of north and central California, and western Oregon. Immediate opportunities exist to grow and culture native species which have never been reproduced on a production scale before. Working with these species will add to our knowledge of the ecosystems in which they occur. The Nursery would become a laboratory in addition to a high volume producer, and a tree garden of great diversity.

An opportunity that began testing in 1994 is a partnership arrangement with the University of California Cooperative Extension, through special use permit, whereby the Extension Service makes small local plots available to local area residents for growing commercial agricultural crops on areas temporarily not needed for Nursery production. Such opportunities have the potential to reduce Forest Service costs to maintain areas temporarily out of use, provide some income to the federal treasury, foster partnerships with local agencies, and provide tangible economic benefits to the local community.

Humboldt Nursery is an opportunity for Six Rivers National Forest to offer the public a dramatic and beautiful showcase for our forest management and reforestation practices. Educational and recreational resources, though largely latent, are immense; they only need to be developed. Self-interpreting trails, pamphlets, guided tours, demonstrations, and full scale production operations, all in a scenic pastoral setting, can create an experience for the visitor not available anywhere else in northwestern California.

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on the Humboldt Nursery are essentially the same for all alternatives and are not discussed further in Chapter 4.

## LAW ENFORCEMENT

### Public Issues

Issue 16 How will the Forest reduce the hazard to forest users created by the illegal use of Forest land for marijuana cultivation?

### Introduction

The Forest administers its responsibilities for regulating and protecting National Forest system lands under Title 36 of the Code of Federal Regulations (CFR) and appropriate sections of Titles 16, 18, and 21 of the United States Code.

The U.S. Constitution reserves the authority and responsibility to protect citizens and their property, and general police powers to the states. The states have delegated most of their general police powers to city police departments or local county sheriffs.

While the Forest Service does not co-opt the county sheriff's responsibilities in such matters, it is essential that the agency continues to provide and enforce regulations which govern public behavior. Specific examples relate to the rights, safety, and enjoyment of other users in full partnership with local law enforcement agencies.

Current Situation

Only a small percentage of visitors and permit holders on the Forest commit violations. However, the number of law enforcement incidents is rising steadily due to an increase in the following: the number of visitors and permit holders; conflicts among visitors and holders; pockets of illegal activity on National Forest System and adjacent lands; and users involved in illegal activities.

The Six Rivers National Forest has cooperative law enforcement agreements with Del Norte, Humboldt, and Trinity counties. The services provided by the sheriffs of these counties protect recreation users and their property. These services are reimbursable under the Jurisdiction Act of August 10, 1971, (Public Law 92-82) from National Forest appropriations. The Forest has good working relationships with all three county law enforcement agencies.

Six Rivers personnel also cooperate routinely with other State and Federal agencies such as the California Department of Fish and Game, California Highway Patrol, Federal Bureau of Investigation, U.S. Marshall's Office, and various drug enforcement agencies.

Local law enforcement agencies are small and operate within constrained budgets. Incidents and crimes formerly associated with urban areas, such as vandalism, robbery, assault, burglary, and manufacture and trafficking in controlled substances, as well as rural crimes (including timber theft, poaching, trespass, and marijuana cultivation) occur on the Forest and are increasing. This situation leads to overstretched resources and delayed response by enforcement agencies with Forest jurisdiction, which in turn can expose visitors and Forest employees to potential personal risk.

Opportunities

Internal professional law enforcement support is needed to control the various and complex law enforcement situations occurring on the Forest today. The rise in volume and seriousness of criminal activity, and the increasing hazard to Forest employees, visitors, and permit holders associated with the illegal use of Forest lands to cultivate marijuana, require that additional employees be trained and equipped to function in a full law enforcement capacity.

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on law enforcement are essentially the same for all management alternatives and are not discussed further in Chapter 4.

HERITAGE RESOURCE MANAGEMENT

Public Issues

Issue 17 What constitutes reasonable protection of Indian cultural activities and values?

Introduction

The Resource: Heritage resources on the Forest are varied and complex. They range from 6,000- to 8,000-year-old prehistoric sites, historic mining ditches and cabins, and a collection of Depression Era Forest Service administrative structures built by the Civilian Conservation Corps. They also include a number of sensitive areas which are used by contemporary Indian groups for religious purposes. These sites, along with the cultural history of the Forest, are described in Cultural/ Historical Overview: Six Rivers National Forest (Theodoratus et al, 1980).

Prehistory: Projections that people first entered the Forest region about 6,000 years ago are based on archaeological excavations conducted on the Forest (Hildebrandt and Hayes, 1983; Hayes and Hildebrandt, 1984). The first inhabitants were small groups of hunters and gatherers who hunted deer, elk, and other game and gathered grass seeds and other vegetal materials. Over the last 2,500 years, these groups probably became more socially complex.

Food gathering also became more refined so that a wider range of resources might be used; that is, fishing (perfection of anadromous fishing with nets and weirs), hunting (introduction of the bow and arrow), and ocean going canoes. Evidence of prehistoric use of the area is reflected in the various types of prehistoric sites found on the Forest. These include villages, lithic (stone) flake and tool scatters, quarries, and special use areas.

Ethnography: Prior to the settlement of northwest California by white immigrants, there was a large population of Indians inhabiting the region, including the area which is today Six Rivers National Forest. The territories of ten different groups of Indians included lands which today are part of the National Forest.

The major division among the groups who inhabited the region was in subsistence patterns. Cultures to the north relied more on salmon and other river resources and lived in permanent villages along the Klamath and Trinity rivers. The more southerly groups relied less on river resources and more on gathering plant resources and hunting game for subsistence.

In the north, the Klamath River and Trinity River regions were heavily forested with extensive stands of Douglas-fir and tanoak. The rivers carried large volumes of water and were famous for their large runs of salmon and steelhead. The Tolowa, Karuk, Yurok, Whilkut, Chimariko, Chilula, Hupa, and Tsnungwe who inhabited the northern area of what is today Six Rivers National Forest spoke different languages but had cultures which were similar in many ways.

These northern groups were known for their fishing skills, and during salmon runs they were able to provide a significant portion of their food supply. They also utilized deer, elk, tanoak acorns, and other vegetal food resources, but to a lesser extent than the groups to the south. In addition, these groups were renowned for the beauty of their basketry.

In the southern part of the Forest, the Douglas-fir forests gave way to a mixed evergreen woodland with Douglas-fir, ponderosa pine, incense-cedar, and sugar pine. In addition, there were large areas of oak woodlands and grasslands. The river resources were less abundant and Indian groups were more dependent on resources such as deer, acorns, grass seeds, and other plant resources.

In this region the Nongatl, Lassik, and Wailaki occupied villages along the major waterways in winter, but during the spring and summer they left their villages and moved to the upland country. Here they hunted and collected plant foods such as clovers and, using digging sticks, gathered large amounts of "Indian potatoes." These were several species of bulbous plants including camus. In the fall large numbers of acorns were also collected to help last through the winter when few other food resources were available.

Religion was an important part of the daily life of the Indians in this region. Persons training to become religious healers, or doctors, sought curing powers at specific locations. Ridges, lakes, and mountain peaks came to be associated with acquiring these powers. Indian groups invested trails to these sites with ritual significance, and practitioners would pray at resting places along the trail. Ritual use of these areas did not, however, preclude non-ritual activities such as hunting and gathering.

An extensive trail network linked permanent settlements, gathering areas, and spiritual areas. Trails most often followed ridges and river drainages. Indian trails were also used in historic times by pack trains, miners, and others who settled or traded within the boundaries of the Forest. Some are now followed by modern roadways. Today, while many of the traditional elements of Indian cultures remain, others have been adapted to meet the pressures of a changing environment.

Historic Settlement: The recorded history of the territory now within the Forest boundaries began in 1828 with the explorations of Jedediah Smith and other fur trappers. With the discovery of gold in the north coast ranges, thousands of miners began to enter the region in 1849 and 1850. Settlements along the coast at Trinidad, Crescent City, and Union (later called Arcata) furnished the miners with food and supplies. At many locations within or adjacent to the Forest, including Orleans, Myrtle Creek, and Willow Creek, there were hundreds of miners searching for gold.

In the Mad River drainage to the south, there was no gold but there were extremely rich grazing lands. Settlers established large ranches where they grazed thousands of cattle and sheep on the rangelands of southern Trinity County.

In 1905 the Forest Reserves were established in the region and, with the passage of the National Forest Homestead Act, many 160-acre homesteads were settled upon lands today comprising the Six Rivers National Forest. Most of these homesteads were in the southern part of the Mad River Ranger District. This area was very isolated and the soils not very productive. Today all that remains of many of these homesteads are cabin foundations, fruit trees, and some fencelines. Since the early 1900s, logging and grazing have become the dominant land-use activities on the Forest.

Contemporary Indian Uses of the Forest: There are about 12,000 Indians now living in northwestern California. Many are members of the Yurok, Karuk, Tolowa, Hupa, Tsnungwe, Wiyot, Chilula, Wailaki, or Wintun groups. Many of these Indians still use resources from the Forest and have a

strong sense of aboriginal ownership. These uses include gathering plants both for food and making baskets, as well as hunting and fishing. Indian doctors and traditional healing methods are still used regularly by some members of the community. Some Indian doctors are working with members of the medical community and local hospitals in jointly treating Indian patients. Some portions of the Forest are also used by Indians for ceremonial and religious purposes. For more information on social and contemporary uses see the section on Social Environment.

Current Situation

The orientation for the Forest's heritage resource management program is the study of the past and current relationships between people/cultures and the Forest environment. The purpose of heritage resource inventories on the Forest is to record and conserve traces of the prehistoric and historic records and to identify and respond to cultural concerns relating to the contemporary values of the Indians and others who use the Forest.

Major gaps exist in our understanding of the prehistory of the Forest. One reason for this is that nearly all the sites recorded, as well as those excavated, on the Forest have been related to projects involving timber sale planning. These projects are usually located at mid-slope or on ridge-top areas away from the rivers where much of the prehistorical record of the region lies.

The laws, regulations, and directives which are listed below have been enacted or implemented to conserve and protect our nation's heritage resources:

Preservation of American Antiquities Act of 1906
Historic Sites Act of 1935
National Historic Preservation Act of 1966
National Environmental Policy Act of 1969
Executive Order 11593 (1971)
National Forest Management Act of 1976
Federal Land Policy and Management Act of 1976
American Indian Religious Freedoms Act of 1978
Archaeological Resources Protection Act of 1979
Native American Graves Protection and Repatriation Act of 1990
Guidelines in 36 CFR 800, 36 CFR 60, 63, 66, and 7 CFR 3100
Forest Service Manual, Title 2300

Project inventory, heritage site evaluations (which determine if sites qualify or are eligible for the National Register of Historic Places), and other activities are accomplished on the Forest as prescribed by these laws, regulations, and directives. One of the principal laws affecting Forest management of heritage resources is the National Historic Preservation Act of 1966. This law and implementing regulations directs that heritage resources on Federal lands be inventoried and evaluated. Other laws and regulations (including the Archaeological Resources Protection Act) prohibit the illegal collecting of artifacts from and vandalism to archaeological sites.

Figure III-33. View from Native American Contemporary Use Area.

Heritage resource inventories and studies are currently utilized to identify and record heritage resource sites located on the Forest. These sites are identified utilizing on-the-ground surveys related to Forest Service activities, as well as conducting literature reviews and interviews with local citizens. Significant heritage resources on the Forest include prehistoric and historic sites and locations which have contemporary values for local Indians.

Heritage resource inventories are conducted for any area on the Forest which will be either directly or indirectly affected by a project including timber sales, road building, and any other activities which have a potential to affect heritage resources. These areas are intensively surveyed for heritage resource sites. When necessary, interviews are conducted with individuals who might have knowledge concerning historic or contemporary values within the project area.

Approximately 152,000 acres (15 percent) of the Forest have been inventoried. Most inventories have been accomplished to meet requirements of the National Historic Preservation Act in relation to proposed Forest projects. These surveys have recorded over 980 heritage resource sites on the Forest. To date four cultural districts (the Helkau District, the Panamnik World Renewal Ceremonial District, the Myrtle Creek Mining District, and the Pilot Ridge Archaeological/Historical District) have been determined to be eligible for the National Register of Historic Places. These Districts contain approximately 275 sites. The De-No-To District has been formally listed on the National Register of Historic Places based on its cultural and historical significance. During 1993, the "Mus-yeh-sait-neh" Village and Cultural Landscape Property was formally listed on the National Register of Historic Places. The property is the first cultural landscape listed in California based on ethnographic village geography.

Maintenance and conservation of heritage resource properties depends on identification and assessment during project inventories. The Forest regularly consults with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation for all proposed undertakings. The Forest currently has a Memorandum of Understanding with the SHPO. This formal agreement enables the Forest to make "no effect" determinations for heritage resource properties which will not be affected by projects.

In cases where heritage resource properties might be affected by a project, the Forest follows procedures outlined in 36 CFR 800 (implementing regulations of the National Historic Preservation Act) for consulting with the SHPO and Advisory Council. Nothing in the proposed Forest Plan is inconsistent with the State History Plan.

There are a number of areas on the Forest which have contemporary cultural values important to local Indian communities. Eleven of these areas have been designated Native American Cultural Use Areas (NACUAs) in recognition of American Indian spiritual values associated with them. In addition, a large portion of the Siskiyou Wilderness (approximately 13,200 acres) also is considered to have cultural significance to contemporary Indians.

Currently there are a number of concerns expressed by local Indians over management of the Forest as related to their cultural activities, including:

1. The amount of tanoak being harvested (hardwood sales and type conversion) by the Forest.
2. The availability of food stuffs and basketry material.

3. The management (including burning) of areas used for the gathering of basketry materials.
4. The use of herbicides in Forest management activities.
5. Effects from resource management on traditional cultural activities including some areas on the Forest used for spiritual purposes.

The Forest uses the Coordinated Resource Management concept to promote Indian involvement in resource management activities while also meeting National Forest management needs. This concept allows increased cooperation between tribal governments, individual Indians, and the Forest Service on issues related to cultural use of Forest lands and resources. It also provides an opportunity to incorporate Indian concerns into planning and management at an early stage. Heritage resource management also enables the development of resource management projects that are co-sponsored by Indian tribes, the Forest Service, and other public agencies.

Opportunities

As the dimension of land development increases on private and public lands, a correspondingly greater proportion of the physical remnants of our American heritage, and a large source of scientific and historical data, will be irrevocably lost. As a result, the value of heritage resource sites on National Forest lands will increase with time. This intensifies the need to protect and manage these irreplaceable resources.

The anticipated demand for the identification, evaluation, enhancement, and interpretation of heritage resources will likely be a result of four factors:

1. Timber management, road construction, and other ground disturbing activities.
2. Recreational use and public desire to visit interpreted cultural sites.
3. Indian religious and cultural use.
4. The expansion and intensification of historical and prehistorical research.

Evaluation of heritage resource properties will continue in the future in response to Forest projects. Options to deal with impacts from Forest projects include avoidance, mitigation (lessening of impacts), and data recovery. Enhancement and interpretation have become a high priority on the Forest in recent years and this trend will continue. This enhancement and interpretation of cultural sites is likely to contribute to increased visitor use. Research opportunities will continue to be available, and cooperation between the Forest and the archaeological program at Humboldt State is likely to expand.

Heritage resources inventories have focused on project level undertakings in the past. These undertakings have occurred primarily mid-slope and along ridge lines, thus leaving nearly all the river corridors without inventory data. Increases in recreation, ecosystem management, and heritage resource activities along the river corridors in the future will provide this important inventory data.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on Indian cultural activities and values are discussed further in Chapter 4. These discussions will address some of the questions raised by Issue 3. Other questions related to this issue and to the protection of heritage resource sites cannot

be addressed in this document but will be addressed through project- or program-level NEPA review. Projects or activities that could adversely affect heritage resource sites or values will be avoided or mitigated to protect sites or values in compliance with the rules, regulations, and directives cited above, and direction provided by the Forest Land and Resource Management Plan.

## TRANSPORTATION AND FACILITIES

### Public Issues

Issue 18 Has the Forest considered stopping new road construction and/or obliterating existing roads?

Issue 19 Has the Forest designated existing and future utility corridors?

### Introduction

Properly constructed and maintained facilities are essential to the management of Forest resources. Well planned facilities are essential to the disabled for access to a wide variety of Forest programs and services. Forest staff view facilities management as the continuing process of planning, investigation, evaluation, and implementation of actions to provide for cost-effective, safe, functionally efficient, and aesthetically pleasing facilities for supporting the mission and conducting the work of the Forest. Facilities discussed herein include transportation systems, buildings, utility systems, airports, dams, and other structures that facilitate multiple-use resource management. Hazardous materials management is also addressed. Trails are discussed under the “Recreation” section of this chapter.

As the Forest implements ecosystem management, roads may be closed to protect resource values such as soil, water, wildlife. Roads could be maintained at lower levels, decommissioned, or closed due to reductions in the timber program and budget cuts. Such changes are likely to be an issue if roads that have been traditionally used by the general public - whether for recreation activities, collecting forest products, agricultural or industrial use, or private land access - are no longer available.

### Current Situation

Transportation Facilities: Access to the Forest for management of its resources and for its use and enjoyment by the public is dependent on state and county roads and Forest development roads and trails. Most activities on the Forest, including camping, hunting, fishing, motorized recreation, hiking from wilderness trail heads, enjoying rivers and streams, mining, and gathering fuel-wood and other forest products, are available because a Forest road or trail provides access to them. Driving for pleasure and viewing scenery is the most popular recreational activity occurring on the Forest.

Figure III-34. The Forest Service has structures such as roads, bridges, buildings and campgrounds which are considered facilities, such as this bridge which is having maintenance performed on it.

More than 2,800 miles of road on the Forest are under the jurisdiction (legal right to control or regulate) of a public road agency or the Forest Service (see Table III-26). They are classified as arterial, collector, or local roads. Arterial roads are primary travel routes, usually higher standard roads operated for constant service; they serve large land areas, often connecting to public highways. Collector roads, usually lower standard roads operated for constant or intermittent service, move traffic from local roads or destinations to arterial roads. Local roads, which may be constructed for short- or long-term service, connect destination points with collector roads.

Table III-26.
Miles of Road
within Six Rivers National Forest
by Jurisdiction

| Functional Classification | Forest Service 1/ FDR | Other | State | County | Total |
|---|---|---|---|---|---|
| Arterial | 144 | | 82 | 107 | 333 |
| Collector | 288 | | | 189 | 477 |
| Local | 2,059 | 96 | | 2,155 | |
| Total Miles | 2,491 | 96 | 82 | 296 | 2,965 |

1/ FDR: Forest Development Roads Other: Roads under special use authorization to other than public road agency.

Major transportation routes through the Forest are State Highways 199, 299, 96, and 36. State highways 199 and 299 are designated National Scenic Byways.

Del Norte, Humboldt, and Trinity counties maintain more than 300 miles of road that serve most of the residential areas within the Forest; about 20 percent of them are outside the Forest boundary. Twenty-five miles of road on the Hoopa Indian Reservation provide access to Forest lands, primarily for resource management.

Forest Highways are specially designated roads that qualify for funding under the Federal Lands Highway Program. A public road agency, such as the state or county, has jurisdiction over Forest Highways. The planning process for them is a joint effort among the county and state road departments and the Federal Highway Administration. There are 300 miles of Forest Highway within Six Rivers National Forest as identified in Table III-27.

Table III-27.
Federal Lands Highway Program

Forest Highways

| Responsible Agency | Agency Road Number | Forest Highway Name | Length (Miles) |
|---|---|---|---|
| State of California | 36 | Van Duzen - Peanut | 50.01 |
| Del Norte County | S-427 | South Fork Smith River | 16.0 |
| | 316 | Patricks Creek | 11.4 |
| | 411 | French Hill | 12.4 |
| | 405 | Big Flat | 15.3 |
| Humboldt County | 9R100 | Ishi Pishi | 8.5 |
| | 8Q100 | Red Cap | 7.2 |
| | 7M100 | Brannan Mountain | 6.9 |
| | 8M130 | Patterson | 3.1 |
| | 7K100 | Titlow Hill | 6.3 |
| | 8L100 | Friday Ridge | 3.3 |
| Trinity County | 447 | South Fork | 10.8 |
| | 402 | Denny | 5.4 |
| | 511 | Van Duzen | 15.5 |
| | 501 | Lower Mad River | 17.1 |
| | 504 | Upper Mad River | 12.3 |
| | 503 | Zenia Lake | 17.0 |
| | 520 | Long Ridge | 10.0 |
| | 524 | Barry Creek | 3.8 |
| Humboldt County | F6B165/F8L090 | Alderpoint - | 56.7 |
| Trinity County | T-516/T-502 | Zenia - Ruth | 11.0 |
| | C8C100/519 | Hoaglin/Peak | |

1/ Shared with Shasta-Trinity NF

Travel within the Forest is primarily on roads constructed under timber sale contracts. Existing roads under Forest Service jurisdiction consist of approximately 2,500 miles of permanent roads, which are designated as components of the Forest development transportation system. More than 1,800 of those miles are designed and maintained primarily for high clearance vehicles such as logging trucks, pickups, and off-highway (OHV) recreational vehicles; less than 200 miles are designed and maintained for passenger vehicle use at speeds over 20 miles per hour. The Forest also contains over 200 miles of uninventoried roads, which consist of temporary roads (short-lived roads not necessary for future resource management and not part of the Forest development transportation system) and roads that are used by others but are not authorized.

When planning and locating roads for resource management activities, Forest staff places emphasis on providing the minimum standard required by the expected uses of the road. This approach reduces adverse impacts on other resources by minimizing ground disturbance to only that necessary to accommodate long-term access. Current road locations, design standards, and practices are based on a combination of interdisciplinary field evaluation and economic analyses. Current practices ensure that new roads constructed primarily for timber harvest activities have minimum adverse impacts.

Current average costs to reconstruct existing roads are $10,000 per mile for Level 1 (lowest standard) roads, $15,000 per mile for Level 2 roads, and $30,000 per mile for higher level roads. Current average costs to construct new roads are $20,000 per mile for Level 1 roads and $30,000 per mile for Level 2 roads. Construction costs for higher level roads are not given because there are no new ones planned for construction during the next decade. Current costs to decommission Level 1 and 2 roads and remove them from the system range upward from $5,000 and $15,000 per mile.

The existing Forest development transportation system is generally adequate in terms of road geometry and maintenance levels to accommodate existing and projected transportation needs. All 36 bridges and 34 major culverts in the Forest transportation system are in good condition. Current direction is to close roads not needed for resource management and to manage needed roads at the lowest maintenance level consistent with resource management needs. In addition some roads which are no longer needed will be reclaimed (decommissioned) under each alternative.

There are some roads and trails on the Forest which were constructed upon historic exploration, mining, and settlement routes. The most notable of these is the Kelsey Trail in the Smith River NRA. The historic portions of Forest roads and trails are potentially eligible for nomination to the National Register of Historic Places and will be maintained in accordance with the provisions of the National Historic Preservation Act of 1966.

Buildings, Utility Systems, and Other Facilities: The Forest Facility Master Plan identifies facilities needed to support the Forest program of work and guides prioritization for construction, acquisition, disposal, renovation, and maintenance of facilities.

The Forest leases 3 administrative sites with permanent structures - the Forest Supervisor’s office and auto shop in Eureka (the auto shop was relocated on the office site in the fall of 1994) and the Willow Creek and Mad River Ranger Stations. The leased ranger stations may be replaced with more cost-effective government-owned facilities within the next 15 years.

The federal government owns nine administrative sites: two ranger stations, five work centers, a housing compound and the Humboldt Nursery. The Ammon Work Center is currently used by Humboldt State University as an education center for natural resource students.

Some of the structures at administrative, recreational, and lookout sites are 50 years of age or older and are, therefore, potentially eligible for nomination to the National Register of Historic Places. Those sites are: Gasquet Ranger Station Compound, Patrick Creek Campground, Big Flat Guard Station, Camp Six Lookout, Orleans Mountain Lookout, Salyer Guard Station, Mad River Ranger Station housing compound, Zenia Guard Station, and Kettenpom Lookout.

These historic structures all date from the Depression Era and were constructed by the Forest Service with labor supplied by the Civilian Conservation Corps as part of President Franklin Roosevelt's New Deal (1933-1942). With the exception of one architect-designed ranger's residence at the Gasquet Ranger Station, they are all constructed in a rustic vernacular architectural style. These structures will increase in historic value with the passage of time. The Forest is required to recognize their maintenance as a "significant undertaking" under the provisions of the National Historic Preservation Act of 1966, as amended.

Forest facilities are presently being inventoried and evaluated to determine potential eligibility for the National Register of Historic Places. Any government-owned structures 50 years of age or older are potentially eligible.

The Forest operates and maintains 6 water systems at administrative sites and 10 water systems at recreational sites. All Forest Service water systems must comply with the federal Safe Drinking Water Act and the California Safe Drinking Water Act (SDWA). To comply with the SDWA, the Forest performs required water system monitoring and makes necessary improvements to recreation and administrative site drinking water facilities to comply with regulations required by these laws. Systems found to not be in compliance with standards are closed (or posted) until they are brought into compliance.

The major airport serving the Forest, Arcata Airport, is located in McKinleyville, approximately 11 miles north of Eureka. One commuter airline provides regularly scheduled links between the airport and Sacramento and San Francisco. A second commuter airline began regularly scheduled flights to and from Portland in June, 1994, and a third began flights to and from Reno in August, 1994. Four county-owned airfields at Gasquet, Hoopa, Dinsmore, and Ruth also serve the Forest and adjacent lands. The Ruth facility is located partially on National Forest lands; the others are on non-Forest lands.

Airfields on National Forest System land are subject to Federal Aviation Administration and state requirements. Heliports are maintained at Mad River, Ammon Station, Orleans Bar, and Willow Creek; only the latter is on non-Forest land. "Helispots" are maintained throughout the Forest as needed for resource management activities and for emergencies such as fire suppression and search and rescue operations.

Three county-owned solid waste transfer stations are located within the Forest; the Del Norte County site at Gasquet and Humboldt County site at Orleans are on National Forest System lands.

Matthews Dam, owned and operated by the Humboldt Bay Municipal Water District (HBMWD), impounds Ruth Lake in the headwaters of the Mad River. It is the only dam facility on the Forest that falls under the jurisdiction of the California Division of Dam Safety. The reservoir's first stage constructed capacity is 50,000 acre feet at 2,670 feet elevation. The second stage of the project was planned to meet anticipated increased demand for 120,000 acre feet by the year 2011 by raising the earth fill dam 43 feet. HBMWD currently anticipates that the existing facility will meet demand for domestic, irrigation, and industrial water during the next 10 to 15 years. Planning will begin within 15 to 20 years to raise or replace the existing dam and the reservoir will be enlarged within the 50 year planning horizon (Art Bolli, personal communication, 1991). There are three small dams under Forest Service jurisdiction.

Primary electric transmission lines crossing the Forest move power from Oregon to Crescent City and from the Redding area to Humboldt Bay. (See descriptions in Lands section.) The lines are in corridors identified in the Western Regional Corridor Study completed for the Western Utility Group in 1992. This study identified no proposed additions to these corridors.

Smaller electric transmission and distribution lines, both buried and on poles, cross the Forest to supply power to communities within the Forest. Small voltage lines may be needed across Forest lands to distribute power to new developments on private land. Telephone lines often share rights-of-way with power lines. A twelve-inch pipeline carrying natural gas from the Redding area to Humboldt Bay crosses the Forest just north of the Mad River Ranger Station.

Nine mountaintop communication sites on National Forest System land are used solely by the Forest Service. Other sites are administered by the Forest for use by others; they are discussed in the "Lands" Section of this chapter and shown on the included map.

Recreation facilities are discussed under the "Recreation" section of this chapter.

Hazardous Materials Management: Forest Service management of hazardous materials is regulated by numerous laws and associated regulations, including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); the Resource Conservation and Recovery Act (RCRA); the Clean Water Act (CWA); the Clean Air Act (CAA); the Toxic Substance Control Act (TSCA); the Federal Insecticide; Fungicide and Rodenticide Act (FIFRA); the Occupational Safety and Health Act (OSHA); and the Superfund Amendments and Reauthorization Act (SARA).

CERCLA establishes procedures and standards for responding to releases of hazardous substances, cost recovery, and natural resource damage actions. To comply with CERCLA, the Forest performs "discovery," followed by appropriate removal or remedial work at abandoned mines, landfills, and other sites where there have been releases of hazardous substances into the environment. This program includes seeking cost recovery from potentially responsible parties.

RCRA established a regulatory system to track hazardous wastes from generation to disposal. To comply with RCRA, the Forest manifests and disposes of hazardous waste generated at its facilities. Proper removal of underground storage tanks containing hazardous substances, and associated cleanup of contaminated soils and groundwater, is performed to comply with this law and associated California laws and regulations.

CWA provides for the restoration and maintenance of the chemical, physical, and biological integrity of the waters of the United States. To comply with the CWA, the Forest provides cleanup and control of all discharges, including hazardous substances, into the waters of the United States.

CAA protects and enhances the quality of the Nation's air resources and enforces prevention and control of air pollution. To comply with CAA, the Forest identifies and manages airborne hazardous substances, including asbestos-containing materials and radon.

TSCA ensures protection of human health and the environment from risks associated with chemicals (such as polychlorinated biphenyls), by requiring testing, record keeping, reporting, and notices.

FIFRA regulates the manufacture, registration, classification, distribution, sale, shipment, storage, use, and disposal of pesticides.

OSHA ensures safe and healthful working conditions by requiring safe management of hazardous materials through the Hazard Communication (Employee Right-to-Know) program. This program includes hazardous materials identification (inventory), labeling and Material Safety Data Sheets, and training, use of proper personal protective equipment, appropriate medical surveillance, and other provisions for workers involved with hazardous waste cleanup operations and responding to emergencies involving hazardous substance releases.

Title III of the SARA, associated California laws, and Executive Order 12856 include Emergency Planning and Community Right-to-Know requirements. Owners of facilities who store hazardous materials in quantities greater than Threshold Planning Quantities must provide chemical inventory information to appropriate administering agencies, so they may safely respond to emergencies at our facilities.

Eight sites on the Forest were investigated for hazardous material cleanup under the superfund Act. They are all in conformance with the RCRA and CERCLA requirements. These include abandoned mines and old dump (solid waste) sites. Some additional work for sediment control is being done on the mines under the CWA.

Opportunities

Transportation Facilities: Forest road management planning and policies must consider and seek input from Forest visitors, local communities, and those whose living depends on Forest resources. Direction will be to serve a diverse group of users with an increasing emphasis on recreational use. As the Forest continues to emphasize recreation opportunities, road and trail management will have a direct effect on the quality of visitors' experiences and their decision whether or not to return. Future road and trail maintenance standards must consider mixed traffic and user safety and comfort.

The need for the uninventoried roads will be reviewed and those roads will either be managed as part of the regulated OHV route system, the Forest Development road system authorized to others, or decommissioned.

Buildings, Utility Systems, and Other Facilities: Most of the Forest's structural facilities presently are in a minimally acceptable condition. Inadequately maintained facilities can adversely affect the health and safety of Forest visitors and employees. The Facilities Master Plan guides the Forest in managing its facilities and prioritizing facility acquisition, renovation, maintenance, and disposal. Maintenance of the Forest's historic structures will need to be addressed in accordance with the provisions of the National Historic Preservation Act of 1966, which requires that the Government "take into account" the historic appearance of the structure when image altering repairs are considered.

The historic nature of these structures must also be considered in connection with the strong role they play as attractions for recreation visitors. Part of the history and heritage of the Forest Service

is interpreted and preserved in its early ranger stations, lookouts, and so forth. The operation, maintenance, and renovation of these structures must consider the cultural resource values they possess and sustain their historic character, fabric, and integrity.

Facilities will be provided that comply with laws, codes, and regulations which provide for user health and safety. Properly maintained facilities will improve user comfort and enjoyment, improve management effectiveness in recruitment and retention, and have a positive effect on resource management. Facility replacement and maintenance funding for Forest buildings and utilities systems will need to greatly increase to bring existing facilities up to standards and provide more access, services, and programs for the physically challenged.

Some of the Forest water systems have been found not to be in compliance with new regulations, and closed or posted; future environmental laws and regulations could find additional water systems and wastewater systems in noncompliance. Facilities will be evaluated for closure, upgrading, or replacement and appropriate action taken. As the Forest increases emphasis on recreational opportunities, there will be a corresponding need to upgrade or install new water systems and wastewater disposal systems to meet public demands.

Three existing utility corridors will be designated in the Forest Plan. None of the transportation routes will be designated as corridors in the Forest Plan.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on the Forest road system are discussed in the Transportation and Facilities section of Chapter 4 of this document; the effects of the availability of road access under the various alternatives on such factors as economics, firewood gathering, recreation, and the social environment are discussed in the appropriate sections of Chapter 4. These discussions will address some of the questions raised by issue 18 concerning constructing and/or decommissioning roads. Other questions related to this issue cannot be addressed in this document but will be addressed through project-level NEPA review as new projects requiring road access are proposed and as existing roads are proposed for change in maintenance level, temporary or permanent closure, or decommissioning.

No use of additional land for primary utility or major transportation routes is anticipated during the planning period, and any additional needs for utilities that do occur would be met by the use of existing corridors or routes where possible. This issue will not be addressed further in Chapter 4.

Figure III-35. This wildfire on the Smith River NRA gives some indication of the problems associated with fire suppression.

FIRE AND FUELS MANAGEMENT

Public Issues

Issue 20 How should the Forest manage fire to protect and improve resources?

Introduction

Fire scars, fire history information, and other evidence indicate that fires have regularly occurred on the Forest. Adams and Sawyer (1980) analyzed fire scars within the Douglas-fir dominated mixed evergreen vegetation type across all four Districts. Preliminary results showed a mean fire free interval of 16 years for the entire Forest, varying from 13 years at Mad River to 21 years at Gasquet. The Final Supplemental Environmental Impact Statement On Management of Habitat For Late - Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl (1994) (FSEIS) places the Forest in the dry to intermediate terrestrial physiographic province. This indicates that fire has been the dominant forest disturbance factor. Typical fire return intervals and fire severities have been found to be highly variable, and wildfires did not always result in complete stand mortality.

Aggressive suppression activity over the last 80 years has resulted in unnatural fuel profiles that are more continuous, both horizontally and vertically. Given a fire start, resulting wildfires could become larger and more destructive than in the past. The absence of fire has decreased the abundance of some old-growth forest types that are dependent on frequent, low intensity fires. Substantial mortality is occurring on the Gasquet and Orleans Districts in knobcone pine, sugar pine, lodgepole pine, and Douglas-fir, creating large expanses of snag patches. Weather variations, whether related to long-term droughts or possible global warming trends, may also increase the number of dead trees and the amount of dead fuels.

For planning purposes, the primary issue for fire is its effect on biodiversity. Both wildfires and prescribed burning affect plant and animal habitat, including stand structure, number of standing snags, amount of large woody debris, soil organic matter content, nutrient availability, and erosion hazard. Wildfires may also have an effect on more immediately impacted human values, such as loss of life and property, loss of timber plantations, and degradation of air quality.

Current Situation

The fire management program consists of two basic elements: 1) wildland fire protection, and 2) wildland fuel management. Activities related to protection are detection, dispatch, prevention, presuppression, and suppression. Fuels-related activities involve removing or rearranging forest fuels to meet protection requirements, preparing areas for seedling planting, providing for and improving forest health, wildlife habitat and rangeland, and providing opportunities for cultural use of forest resources.

Fire Management: The fire suppression organization has been evaluated using economic efficiency criteria to determine the most efficient fire management program that meets management objectives. Where budget constraints have limited the fire management program to less than the most efficient level, the most effective organization for the alternative budget level has been developed.

Suppressing fires while they are still small requires a mix of initial attack resources that is more mobile than what has been traditionally required. The current organization emphasizes ground attack as the primary initial attack resource and consists of five type 3 engines (300 gallons), two type 2 engines (200 gallons), four five-person initial attack handcrews with support from air attack forces.

The Forest's fire history for the period starting in 1970 and ending in 1992 shows an average of 64 fires annually, burning an average of 805 acres per year. The majority of these fires are caused by human activity. Lightning-caused fires constitute about 10 percent of the annual fire starts. Heavy lightning years can cause over 100 fire starts; this occurrence happens every 7 to 8 years. Normally, the Forest averages approximately 10 lightning starts per year.

Arson caused fires continue to be the largest single cause of fire starts on the Forest. These seem to occur in 5 to 7 year cycles and burn an average of 400 to 500 acres annually. The next largest contributor of fire starts is escaped debris burns from private back yard burning.

Over the past 30 years, 90 percent of all fire starts that have escaped initial attack efforts have been controlled at between 50 and 400 acres. Of the remaining 10 percent, only 3 fires have exceeded 5,000 acres; the largest consumed over 12,000 acres in 1987. Except for a major fire that burned in steep, rocky, inaccessible areas, the
effects on the environment have been light to moderate. However, fire scars from large fires occurring in the early part of the century indicate that they had burned at very high intensity levels, causing erosion and severe soil productivity damage.

The long-term fire management objectives within wilderness areas will be focused on the use of fire as a means of restoring and perpetuating "wild" ecosystems. This may include both planned and unplanned (natural) ignitions to achieve wilderness objectives. However, until specific and comprehensive fire management action plans are completed, the Forest's initial approach to fires in wildernesses will be one of control. As with all fires, wilderness fires which escape initial action will be managed on the basis of an escaped fire situation analysis. This involves an interdisciplinary process which considers the current fire situation, values-at-risk, potential losses and benefits, available resources, and the probability of success of various options. Suppression strategy is then based on that analysis. Whatever strategy is selected, the emphasis is on minimal impact tactics. Also, within wildernesses, special approval to employ mechanized equipment is as follows: Regional Forester approval for the use of tractors; District Ranger approval for the use of portable pumps and the building of helispots for fire and rescue. Approvals for the use of all other mechanized equipment for fire management in wildernesses is left to the incident commander.

From the initial attack standpoint, the Forest has been able to secure funding for the same base organization for several years, and this funding is expected to continue for the foreseeable future. Once a fire escapes initial action, reinforcements are requested from cooperating agencies and from the "militia," that is, Forest Service employees from functional areas other than fire management. Recent downsizing, attrition, and reduced budgets have resulted in a significantly reduced militia. Consequently, initial reinforcement will be delayed and, in some cases, fires, which in the past would have been contained by initial attack forces, are likely to require extended action.

The Forest coordinates fire management activities with other agencies in the area. The Forest and the local California Department of Forestry and Fire Protection (CDF) Ranger Unit have developed a strong working relationship. This is evidenced by the Interagency Emergency Command Center located at CDF headquarters in Fortuna, California, and the Interagency Incident Management Team. This combining of resources and overhead personnel (incident managers) has resulted in better coordination and more efficient use of resources in emergency situations.

The recent development of a three-party agreement between the Forest, the Hoopa Indian Tribe, and the Bureau of Indian Affairs has expanded the opportunities to accomplish extensive training of American Indians in the protection and management of the natural resources located on the Hoopa Reservation.

Fuels Management: The objectives of fuel management have mainly been to remove logging residue and prepare sites for reforestation and to lower fire hazard by reducing fuel loadings. The majority of fuels management activities have consisted of prescribed burning of timber sale slash, natural timber, and brush fuels. To a smaller extent burning has been used to enhance rangeland and wildlife habitat and to provide opportunities for collecting forest materials that are used for Native American cultural activities.

A current shift is taking place towards larger area (several hundreds of acres) understory fuel treatments to counteract the unnatural fuel buildups that have resulted from several decades of aggressive suppression. Prescribed burning of these areas reduces the amount of built up fine fuels and duff and attempts to return fire to its natural place in the environment. Fires that burn under conditions of lower temperatures, wetter fuels, and higher humidities leave most of the charcoal, minerals, and coarse woody debris on the ground.

The shift in emphasis from broadcast burning of clearcuts to underburning includes some inherent risks. Large areas may burn in mosaics with varying fire intensity and severity. While this may mimic natural underburning, there are risks associated with retaining coarse woody debris and preserving remaining trees and snags. The likelihood for reburning, spotting, and the killing of some trees is increased as is the possibility for a prescribed burn to escape the planned burn area. But it is anticipated that by prescribed burning under advantageous weather conditions, subsequent detrimental wildfire effects may be reduced due to a decreased amount of available fuel.

The most effective fuel treatment method is used to achieve hazard reduction and resource management objectives. The use of prescribed fire is currently the most economical treatment method available for managing forest fuels. In some cases, to achieve environmentally and ecologically sensitive objectives, alternative, more expensive fuel treatment methods such as handpiling and/or rearrangement of fuels will need to be implemented. These alternative fuel treatments may be used in combination with prescribed burning in order to reduce the fuel loading to acceptable levels, prior to burning. Treatments are monitored to assess their effectiveness in achieving management objectives.

Once natural fuel treatment is approved within our wilderness areas, Regional Forester approval would be necessary for the use of chainsaws or the building of helispots for fuels project work.

Opportunities

Fire will continue to be a part of the ecosystem, and the use of fire through prescribed burning provides the opportunity for ecosystem process restoration, habitat improvement and maintenance, and hazard reduction. Adjusting the timing, intensity, and strategy of prescribed burns will be necessary in order to minimize the impacts on human welfare and to maximize the benefits to Forest resources. For example, in riparian areas it may be less destructive to use the “natural” differences in fuel moistures to restrict prescribed burns from burning the riparian areas, rather than putting in

handlines. Also, in areas close to population centers, smoke management concerns may require the modification of burning prescriptions, or other, more expensive, alternatives may be preferable.

In areas that formerly had low to moderate intensity underburns as part of their natural fire regime (including wilderness and other restricted land allocations), the managed application of fire may be an appropriate strategy for restoring the natural role of fire to the ecosystem. Also, hazard reduction objectives may be satisfied through biomass utilization or stand structure manipulation. Specific objectives, required resource results, vegetation condition, and species flammability would be addressed in the project planning documents.

Cooperative burning opportunities with adjacent landowners, Forests, or agencies may also be explored as a way to treat fuels at the landscape level.

Suppression actions should use strategies and tactics that strive to protect the specific attributes of the various land allocations. Modified suppression strategies, including confinement and containment (rather than complete control), could be considered as a way to reduce the long term hazard for an area. Fire suppression strategies may need to be modified as a result of safety hazards, for example, large numbers of snags or substantial amounts of coarse woody debris.

Opportunities exist to determine the effects of burning on species composition, vegetation patterns, and stand structure.

Revegetation for post-fire should use seeds and plants that originate from genetically local sources of native plants.

### Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on fire and fuels management to protect and improve resources are discussed further in Chapter 4.

## ENERGY RESOURCES MANAGEMENT

### Public Issues

Energy was not identified as an issue or concern during the scoping process. However, it is anticipated that concerns may develop during the planning period about the most appropriate use of vegetative energy sources.

### Introduction

Forest resources are used by the Forest, private industry, and the general public to produce energy in various forms. The Forest manages the use of energy to conserve fuel.

### Current Situation

Energy Production: The potential for energy production generally comes from three sources:

1. Vegetation or biomass: dead or living trees.
2. Elements: water, sun, and wind.
3. Minerals: coal, oil, gas, geothermal resources.

The Six Rivers has potential for energy production from biomass and the elements. Currently, the forest provides more energy from biomass than other sources. Conflicts may be expected to develop around the use of biomass as timber harvest in the area declines, and less biomass is available from lumber mills for commercial co-generation plants.

The potential for energy production from fossil fuels and geothermal resources is considered low (see the Minerals section of this chapter).

Biomass is used either as firewood or for commercial power generation. Biomass may not be taken from areas in the Forest that require leaving biomass in its natural state, such as areas managed for threatened and endangered species habitat or wilderness.

Firewood is available from the Forest as dead and down wood from unmerchantable sawlogs and limbs left in the woods after timber sale harvest, or from naturally weakened or dead trees and limbs. Firewood is also available as living hardwoods in a few areas. Firewood may be gathered, under permit or contract, by individuals or commercial dealers from areas that are not protected or under current timber sale contract.

Figure III-37. Forest Service employees selling firewood permits.

The demand for individual firewood permits increased from 236 in 1970 to a high of almost 5,000 in 1982. This increase reflected the increasing prices of other home heating fuels at a time when individual firewood permits were available free of charge. National policy changed in 1983 to require a charge for most firewood permits, and the demand decreased to 1,300 permits in 1989. Receipts for the permits, at $10 per two-cord minimum transaction, are estimated at $13,000. In a few very remote areas on the Forest, firewood may be obtained free of charge. Commercial dealers buy firewood for resale to the public.

Biomass such as chippable cull logs (logs with insufficient sound wood to warrant sawing into boards), hardwood chip logs and sawmill “by-products” (bark, sawdust) is also used for commercial power generation, depending on market conditions and availability. Co-generation plants produce power continuously in Humboldt County and intermittently in Del Norte County. Even if this material is available from the Forest, it may go unutilized if the market value is too low (its value as a product may not cover the costs of getting it to a manufacturing facility). Likewise, it may be more profitable to sell most of the material as chips and not use it as a domestic fuel source.

In 1989, the Forest sold 210,000 board feet of hardwood sawlogs and 734,000 board feet of cull logs, less than 10 percent of the products sold in 1982. Pacific Gas and Electric Company has purchased limited amounts of power from commercial power generation sources in the Humboldt Bay area, but has not been in the market for more since 1986, and does not anticipate needing more power in the foreseeable future. Consequently, little interest has been expressed in harvesting Forest products primarily for power production.

Pacific Gas and Electric Company (PG&E) provides power to residential and commercial users in Humboldt and Trinity counties. Two hydroelectric plants on the Forest produce and sell power to PG&E. The Humboldt Bay Municipal Water District started operating the Matthews Dam facility on the Mad River in 1983 and provides a steady supply of power at 1,226 kilowatts. The Mill and Sulphur Creek Power Plant near Dinsmore has been in operation since 1988 and, because of a limited water supply during extended drought conditions, has provided power sporadically.

Pacific Power & Light Company (PP&L) serves residential and commercial power customers in Del Norte County. All of PP&L's power comes from Oregon; it buys no hydroelectric or other commercial power locally. Demand for more electricity from PP&L increased 2.8 percent in 1988, 6 percent in 1989, and eleven percent in 1990, largely from growth associated with Pelican Bay State Prison near Crescent City.

Other potential energy sources on the Forest include solar and wind power. Solar-powered facilities are used at communications sites and other remote locations on the Forest. Vandalism at less remote sites and the cost of replacing vandalized panels has tended to limit their use and will probably continue to do so. The State Energy Plan has indicated that there is potential to generate wind power on the Forest, but specific sites have not been designated.

Energy conservation: Energy conservation efforts have been directed toward reducing Forest Service fleet fuel usage and improving the efficiency of Forest Service facilities to the extent possible with the limited funds available. Newer vehicles in the fleet are smaller and use fuel more efficiently than a decade ago. The Forest Service has fitted water heaters with blankets and showers with low volume shower heads to conserve energy and water. Fireplaces in some residences have been fitted with inserts, by either the Forest Service or tenants, to use fuel more efficiently.

Opportunities

Energy production: The demand for firewood in the future will depend on costs of alternate energy sources (electricity, gas, pellet stove fuel), any Forest Service permit price increases and policy changes, any new air pollution restrictions on wood stove or fireplace emissions, and local population increases.

The use of biomass affects plant and animal species that are dependent on its existence for their habitat needs. Biomass for firewood and commercial power generation will become less available if less timber is harvested and more and/or larger areas are designated where dead and down wood will be left in place in order to protect the habitat of plant and animal species dependent on its existence.

Demand for electricity from PG&E's Humboldt Division increased about five percent per year over the past decade. This trend is expected to continue or accelerate only slightly during the next decade, although demand may increase more if local efforts to attract light industry and tourism into Humboldt County succeed. PG&E anticipates meeting its energy needs during the planning period from existing sources. No hydroelectric development proposals have been filed with the Federal Energy Regulatory Commission since 1986, and none are currently active. Additional hydropower developments are not anticipated during the planning period.

PP&L projects that future demand will level off at 6-7 percent per year for the next 10 years unless the anticipated growth in tourism and commercial expansion is stifled. PP&L estimates that its existing facilities have the capacity to meet demands for the next 20 years.

Energy conservation: The Forest will continue to explore ways to conserve energy by using new technology when savings/investment ratios are favorable.

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on energy production and conservation are essentially the same for all plan alternatives and are not discussed further in Chapter 4. The potential effects of specific projects on energy production and conservation will be considered during the project-level NEPA process.

LANDS PROGRAM MANAGEMENT

Public Issues

No public issues were identified for this element.

Introduction

Past public input to the planning process has indicated little concern that Forest activities would adversely affect private inholders. However, the subdivision of undeveloped private land within the Forest and development of the subdivisions for rural residential use are trends that continue to place demands on adjacent National Forest System (NFS) lands for uses such as roads, power lines, and domestic water developments. In addition, as the character of the population in the larger coastal communities changes as described in the Social section of this chapter, people are likely to seek more and different recreational opportunities from the National Forest than those currently provided. Conflicts between private land use and National Forest objectives, programs, and purposes are expected to increase. Some examples follow.

Contrasting land uses may require more intensive planning and monitoring to reduce conflicts caused by activities such as timber management near residential development or grazing on private lands managed for agricultural uses.

Forest Service policy to obtain unlimited public access across private lands to public lands may conflict with private landowner desires for privacy or fear of trespass and liability.

Boundaries between the National Forest and adjoining private lands offer opportunity for trespass, on private lands by the public and on National Forest land by private landowners and their contractors and agents. This is especially so where landlines are not obviously marked or not marked at all. Survey and marking to avoid trespass is costly for Federal and private landowners.

Inaccuracies in old surveys result in many instances of innocent encroachment, in which residential or agricultural improvements are located on Federal lands that are thought to be in private ownership. When new, properly controlled surveys are completed, the encroachments are

discovered and must be resolved. Owners of encroaching improvements often have difficulty understanding why they do not own the land under their improvements and accepting the alternatives for resolution.

Current Situation

Nearly all the National Forest System land comprising the Six Rivers National Forest was reserved from the public domain by Presidential Proclamation between 1905 and 1910. The lands within the Six Rivers National Forest were originally reserved as portions of the Siskiyou, Klamath, and Trinity National Forests. Private acquisitions of public domain land prior to the establishment of these forests occurred as the result of various land acts encouraging settlement or timber or mineral production. Today, private lands generally occur in the following patterns within the Forest boundary; small parcels from city-lot size to 20 acres in and near town sites, increasing in size farther away from town; and holdings in more remote areas of the Forest ranging from 40 to 160 acres with some larger holdings up to several square miles. Timber companies have the largest holdings within the Forest boundary. Some consolidation of ownership has occurred through exchange and donation, especially with larger private timber industry inholders.

Special Uses: A variety of Forest land uses are authorized in the form of special-use permits and easements. There are approximately 340 non-recreation authorizations utilizing approximately 3,800 acres. About 290 of these authorizations cover 470 miles of right-of-way for transportation (including state and county roads), utilities, communications (including mountaintop sites), and water related uses. The remaining 50 or so include authorizations for agriculture (fish hatcheries, livestock areas, apiary), community (church, volunteer fire department buildings, school, solid waste transfer stations), study (weather station), and industry (highway maintenance stations, highway fill-material stockpiles). Recreation special uses (resort, organization camp, outfitter/guide) are discussed in the recreation section.

There are 43 miles of powerline crossing National Forest System lands within three existing utility corridors identified in the Western Regional Corridor Study completed for the Western Utility Group (WUG) in 1992. These corridors include about 19 miles in Pacific Power & Light Company's Line 38 and Line 34 corridor in the Smith River NRA, 4 miles in PG&E's Cottonwood-Humboldt #1 corridor in the Lower Trinity District, and 2 miles in PG&E's Cottonwood Humboldt #2 corridor in the Mad River District. The WUG study identified no proposed additions to these corridors.

No solid waste disposal sites have been authorized or used on the Forest since the early 1980s. The known closed sanitary landfill sites on the Forest were investigated for hazardous material cleanup under CERCLA (Comprehensive Environmental Response Compensation and Liability Act of 1980). All the sites were found to conform with CERCLA and RCRA (Resource Conservation and Recovery Act of 1976).

Humboldt Bay Municipal Water District's special use permit for Matthews Dam and Ruth Reservoir encompasses approximately 240 acres of NFS land plus additional non-Federal land. Increasing the size of the reservoir as discussed in the "Facilities" section of this chapter would require the use of additional NFS land to encompass a buffer strip 300 feet beyond 2,710 feet elevation.

Current Forest Service policy provides that special uses will conform to or not conflict with the approved Forest Plan. National Forest System land may not be used to further the development of private land and subdivisions until the effects of the proposal on the environment and the management of the National Forest have been evaluated. Private lands are expected to be developed to the level that amenities are available from non-National Forest sources.

Communications Uses: There are eight sites on the Forest where communications equipment is being operated by entities other than government agencies under special-use authorization. Six other sites are used only by government agencies. All of these sites have been used for communications purposes for 25 years or longer. These sites are shown in Figure III-38. Legal descriptions and site-specific information for these sites are summarized in Table III-28. Further descriptions and maps are on file in the Lands section at the Forest Service office in Eureka and at the appropriate Ranger District office.

Red Mountain, Camp Six, Horse Mountain, and Pickett Peak are multi-use commercial sites used by state and local government agencies and non-government users. All are used for internal two-way radio and mobile radio repeaters and broadcast translators. Other uses include point-to-point, common carrier and industrial microwave, amateur repeater, and resource monitoring. Pickett Peak is on both the Six Rivers and Shasta-Trinity National Forests and is administered by the Shasta-Trinity.

The Forest issued separate authorizations to building owners and to each tenant in a building prior to 1988. Since 1988, the Forest has issued multi-user authorizations to building owners who rent space to others. This has eliminated the need for multiple authorizations related to one building ownership, recognizing the building owner's ability to manage its facility and reducing the Forest's workload of administering authorizations for those sites by more than half.

The number of communications uses associated with the timber industry has diminished with the decline of the industry, and uses by the communications industry have increased slightly over the last decade. There are spaces for 10 or more additional uses in tenant-occupied buildings at Camp Six and for 25 or more additional uses at Horse Mountain. Facilities at Red Mountain need to be upgraded to accommodate anticipated new uses and ensure public safety or alternatives found to meet needs currently met at the site). The trend in communications technology is toward more uses in less space. There is no anticipated need to expand these three sites during the next 10-15 years.

Somes Ridge, Antenna Ridge, Baldwin Ridge, and Windy Nip are single-use commercial sites used for broadcast translators and passive reflectors. There are no buildings at these sites. Idlewild, Smith River National Recreation Area Ranger Station, Orleans Ranger Station, Grouse Mountain, Orleans Mountain, and Kettenpom Peak are used by Federal, State, and/or local government agencies for resource monitoring and internal two-way radio. Equipment at these sites is housed in administrative facilities.

Multi-use communications sites are designated by the Regional Forester as part of the land management planning process. Forest Service policy requires that sites be designated and individual site plans approved before new authorizations are approved, except for single uses which involve minor development. Site plans have been approved for Camp Six, Baldwin Ridge, Orleans Mountain, Antenna Ridge, Horse Mountain, and Pickett Peak. These site plans need to be reviewed

and updated as appropriate for current and foreseeable communications technology and management and other resource needs, including heritage resources at Camp Six and botanical values at Horse Mountain. Red Mountain must be evaluated for alternatives that consider communication needs, Native American values, and other resource and management needs. Other sites may need to be studied for potential communication site designation as communications needs and technology change. Existing undesignated sites may need to be evaluated for designation in the future.

Right-of-Way Acquisition: The United States must acquire rights-of-way to construct, use, and maintain roads and trails on non-Forest lands. Rights-of-way are acquired for timber harvest, administrative needs, and public recreation access. It is anticipated that five rights-of-way will be needed in each of the next five years; three of those will be for recreational purposes. Right-of-way acquisition during the remainder of the planning period will depend on which units are planned for harvest and what recreation developments are planned.

Adjustments: Past exchanges often traded forested NFS lands that were isolated and/or lacking legal access for significantly larger acreages of cutover private lands to consolidate federal ownership. Many of these exchanges involved hundreds or thousands of acres. While consolidating ownership remains an objective of the land adjustment program, other factors have shifted the focus of the program to smaller acreages exchanged to meet different needs. The factors are: the current direction to retain ownership of timbered lands; fewer NFS parcels outside the main forest boundary still eligible for exchange; fewer large private ownerships inside the main forest boundary; increasing costs to manage lands which have lost their National Forest character or are no longer suitable for National Forest purposes, especially where administration of special use authorizations is involved; increasing local community; and the shrinking federal budget.

Most exchanges during the planning period will probably be for 40- to 160-acre parcels at the rate of one to three cases completed each year. The increasing attention being given the Forest due to its old growth timber and related wildlife species, wilderness and wild and scenic river values, and the Smith River National Recreation Area (NRA) may generate more partnerships with public land trust organizations to acquire high priority parcels. It is anticipated that priority would be given for adjustments that would bring into federal ownership lands within wildernesses, the NRA, and the wild and scenic rivers system; provide habitat for threatened or endangered plants and animals; and/ or transfer out of federal ownership those lands that are costly to administer, that are no longer suitable for National Forest purposes, or are needed for expanding community purposes, when such adjustments are clearly in the public interest.

Land Line Location: There are approximately 1,300 miles of boundary line between public and private land located within and adjacent to the Six Rivers National Forest. Four hundred of these miles are unsurveyed or inadequately surveyed. The exterior boundary on the west adjoins undeveloped timber and range lands except where it lies close to the communities of Hiouchi, Kettenpom, and Hoaglin. The Forest boundary from Hiouchi northward was changed by the Smith River National Recreation Area Act to generally coincide with the westernmost Federal land holdings.

Small Tracts Act: One objective of the Small Tracts Act (STA) program is to resolve innocent encroachment on Forest land resulting from faulty surveys. Private land owners have innocently encroached on adjoining NFS lands because early surveys were erroneous or surveys of federal lands

were not complete. Federal surveys completed in recent years have identified many of these innocent encroachments. The encroachments often include areas with houses and other improvements and have been managed as private holdings for many years by the adjoining land owners and state, local, and federal agencies, including the Forest Service.

The Forest has completed about 25 STA cases, transferring small parcels to private landowners, since 1984. There are an estimated 60 to 70 cases to be resolved under STA authority, not all of which have yet been identified.

The Small Tracts Act includes a restriction (16 U.S.C. 521(i), Sec 7) that "Nothing in this Act shall authorize the conveyance of Federal land within the National Wilderness Preservation System, the National Wild and Scenic Rivers System..." The Klamath and Trinity rivers are part of the Wild and Scenic Rivers System; their boundaries have not been determined. Twenty-five of the known encroachments are within one quarter mile of these streams. Under a 1986 court decision these encroached lands must be managed as though they are within the Wild and Scenic Rivers System until the boundaries have been determined, and they cannot be conveyed to private ownership under the Small Tracts Act. These encroachments may qualify for STA resolution if they are determined to be outside the boundaries of or excluded from the wild and scenic rivers. Most are located in areas of private development, have lost their National Forest character, are situated on bluffs above the rivers, and are not visible from the rivers. Applications to purchase many of these encroached lands under STA authority date from as early as 1984, and action cannot be completed on otherwise qualified cases until the wild and scenic river boundaries are determined and encroached areas are outside of or excluded from the Wild and Scenic Rivers System. Additional innocent encroachments are expected to be identified as surveys are completed. Some of the encroachments may be within areas included in the Wild and Scenic Rivers System, and the adjoining land owner would qualify for relief under STA if the encroached lands were outside or excluded from the system.

A second objective of the Small Tracts Act is to dispose of mineral fractions, small parcels of National Forest System land that cannot be efficiently administered because of size, shape, or location, and are interspersed among private lands described by mineral surveys. Mineral fractions are often situated similarly to encroached areas and would be more logical in private ownership.

The Small Tracts Act, in addition to sale, provides for exchange or interchange of private lands for encroached lands and mineral fractions. Exchange or interchange under STA could enable acquiring lands suitable for inclusion in the National Forest System, including the Wild and Scenic Rivers System, enhancing management of the forest in general and/or wild and scenic rivers in particular. Suitable private lands could be undeveloped or could be developed in a way that is not inconsistent with the management direction for the area.

The Forest expects to process the existing backlog of STA cases within five years of designation of the wild and scenic river boundaries and thereafter to process five to seven STA cases a year.

Unauthorized use: There are approximately 100 known cases of unauthorized use on the Forest in addition to the innocent encroachments identified as potential STA cases. These are of two types: residential development of mining claims that is not justifiably related to mining and is not covered by an approved operating plan; and unauthorized use and/or occupancy of National Forest land not related to mining claims. Uses associated with mining claims represent a small percentage of cases,

but they are often most difficult to resolve. Additional cases of unauthorized use of National Forest land are expected to occur and be discovered at a rate of 10 to 20 cases a year.

Withdrawals: Lands within Congressionally designated areas, such as wilderness, Smith River NRA, and the Wild and Scenic Rivers System, are withdrawn from entry, sale, or other disposition under the public land laws of the United States, except that lands within the Wild and Scenic Rivers System may be exchanged for other lands within the System with approximately equal values. The same provisions apply to lands designated by the Secretary of Interior for inclusion in the Wild and Scenic Rivers System (Klamath, Trinity, and North Fork Eel rivers).

The Bureau of Land Management (BLM) has nine power site classifications and two power site reserves on the Forest. The lands so designated are withdrawn from disposal under the public land laws. The classifications affect significant areas on the Smith, South Fork Smith, Klamath, South Fork Trinity, Van Duzen, and North Fork Eel rivers. The reserves affect two small areas on the Klamath River and Cow Creek (Trinity River drainage). The two classifications on the Smith River have been superseded by the Smith River National Recreation Area (NRA) withdrawals. It is expected that the remaining designations will be terminated during the planning period.

Opportunities

Ensuring that the Lands program does not conflict with the Forest Plan will also ensure that it does not conflict with the FSEIS ROD.

Special Uses: Access across NFS land to subdivisions will be authorized to the proper public road authority-usually the county-or, failing acceptance of a road into the county's system, to a legally formed entity capable of representing all the present and future owners within the subdivision. Those special use permits that are valid when the Forest Plan is adopted will continue in effect, but those uses not in conformance with the Plan will need to be discontinued or brought into conformance within a reasonable time period.
Lands currently under special use authorization that have lost their National Forest character may be considered for exchange for Forest Service administrative sites. Such lands include communication sites, state or county uses other than roads, and uses by community organizations.

Figure III-39. The Forest Service occasionally needs rights-of-way over other landowners' property as depicted in this photograph.

The utility corridors identified in the 1992 Western Regional Corridor Study will be designated as utility corridors in the Forest Plan. See Transportation and Facilities section of this chapter.

Communication Sites: Camp Six, Horse Mountain, and the portion of Pickett Peak within the Six Rivers National Forest will be designated as communications sites in the Forest Plan. Red Mountain will be studied further. The remaining sites are for single uses involving minor development, resource monitoring, or government agency use only and will not be designated as communication sites in the Forest Plan; existing uses will continue to be authorized at these sites.

Updating site plans at Camp Six, and Horse Mountain will offer opportunities to plan for orderly growth and development of communications sites and for protection or enhancement of other resource values at those sites. Site planning will consider having entities other than the Forest Service manage the communications sites. Site managers could be users associations, professional communications management companies, or other entities. Site planning will be accomplished through the public involvement and NEPA process. A tentative schedule for site plan revision is in Plan Chapter 5.

Right-of-Way Acquisition: Land owners in more remote portions of the forest may not welcome the perceived intrusion of the government and the public into their land holdings, and acquiring appropriate rights-of-way through those properties may require more delicate and extensive negotiations. In the long term, the need for new rights-of-way will shift to provide access for public recreation activities.

Adjustments: Land donations and purchases will be more likely as options for land acquisition than before. The Forest will acquire land within the NRA as opportunities and funds become available. Land and Water Conservation Funds may be more available for purchasing western forest recreation land, especially within the NRA.

It may be desirable in the future to acquire land or new administrative sites (Ranger Stations) for the Mad River and Lower Trinity districts. Forest Service administrative sites could be acquired in exchange for various sites under special use authorization, such as the Horse Mountain communication site, the Trinity County road maintenance yard and Trinity Valley Grange at Hawkins Bar, and the Trinity County airport at Ruth, which have all lost their National Forest character. Other lands under special use permit may also be considered for exchange for non-federal lands; examples include Camp Kimtu, the Veterans of Foreign Wars ballfield at Willow Creek, Hawkins Bar and Salyer Volunteer Fire departments, Salyer Wayside Church, Del Norte County Mountain Elementary School at Gasquet, and the California Department of Transportation roadside rest at Salyer and two highway maintenance stations at Orleans and Idlewild (near Gasquet). A land adjustment strategy will be developed and updated periodically to guide the land adjustment program and provide information for exchange proponents. The strategy is identified in Plan Chapter 5.

Land Line Location: Most of the 400 miles of unsurveyed or inadequately surveyed boundary line between Government and private land are planned to be surveyed, marked, and posted to standards by the year 2010. As this program progresses, additional encroachments will be discovered. Private landowners may share costs with the Forest Service to better identify the landlines for their land management purposes.

Small Tracts Act: Encroachment cases resulting from erroneous past surveys may be resolved by selling to the encroaching adjacent owner the minimum amount of land necessary to eliminate the encroachment. Some mineral fractions may be sold to consolidate ownerships and reduce management problems (mineral fractions are small parcels of National Forest System land that cannot be efficiently administered because of size, shape, or location, and are interspersed among private lands described by mineral surveys).

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on land and real estate management, except use of Small Tracts Act authority, are essentially the same for all management alternatives and are not discussed further in Chapter 4. Wild and scenic river boundaries vary among alternatives; these variations will affect use of the Small Tracts Act authority, and the consequences are discussed in Chapter 4. The potential effects of specific projects on land and real estate management will be considered during the project-level NEPA process.

## MINERALS MANAGEMENT

### Public Issues

Issue 21 How will the effects of mining be managed?

### Introduction

A variety of minerals are found on the Forest. Metallic minerals (gold, chromite, mercury, nickel, cobalt, manganese and copper), asbestos, and common variety minerals (sand, gravel, concrete aggregate, building stone and riprap) exist in various areas and have all been mined at various times.

Development of the mineral resources on the Forest began in the 1850s by early placer gold miners. Copper was mined in the northern part of the Forest in the 1860s. Chromite, manganese, and small amounts of mercury have been mined, principally during wartime periods, into the 1950s. Small scale gold mining has continued to the present day, and there was renewed interest in mining during the 1970s and 1980s with exploration for cobalt, nickel, gold, and platinum. Aggregate used in road building has been mined from the Forest since the late 1800s, and the amount has increased greatly in the last 30 years.

### Current Situation

Authorities and Policies: Prospecting, location, and development of mineral resources within the National Forest are authorized by the Organic Act of June 4, 1897. The Act also allows the Secretary of Agriculture to set out rules and regulations in connection with operations authorized by mining law. These regulations, which define procedures and direct actions to mitigate impacts on the surface resources, can be found in 36 CFR 228 and 36 CFR 293.14. Regulations are being prepared at this time to address mining activities within the Smith River National Recreation Area (NRA).

The Bureau of Land Management (BLM) is responsible for administering the general mining laws on National Forest lands. The Forest Service is responsible for managing surface resources on National Forest System (NFS) land in any mining or mineral leasing activity. The Forest Service has authority to manage and dispose of common variety minerals. Memoranda of understanding between the BLM and Forest Service ensure efficient coordination between general surface resource management by the Forest Service and administration of the mining laws by BLM.

Coordination between the Forest and state and local agencies in regard to the State Surface Mining and Reclamation Act (SMARA) follows direction in a 1992 Memorandum of Understanding

between the Forest Service Pacific Southwest Region, BLM, and the State of California. There are no known conflicts between this EIS and Forest Plan and any State, local, or Federal agency's plans.

Current Forest Service policy and direction for minerals and energy minerals management is to encourage and facilitate the exploration and development of National Forest mineral resources. It is also the Agency's responsibility to ensure that any activities incidental to mining are conducted in an environmentally sound manner and that any resulting land disturbance is reclaimed for other productive uses.

Present direction for common variety mineral materials is to dispose of these minerals when it is determined that disposal is not detrimental to the public interest and that the benefits exceed the cost and other resource impacts. It is Forest Service policy to maintain an inventory of mineral materials, and to assure an adequate in-service supply before allowing for disposal for external use.

Mineral exploration and development depend on the ability to access the mineral deposit and often require roads for transporting ore or processed metals to market. Access for mineral exploration and development is generally unrestricted on the Forest, except that adverse impacts to surface resources must be minimized or mitigated.

Lands Closed to Mineral Entry: Lands acquired under certain authorities are excluded from mineral entry. Some lands have been withdrawn from entry, location, patent, and development under the mining laws, subject to valid existing rights. Lands closed to mineral entry are summarized in Table III-29.

Table III-29.
Areas Closed to Mineral Entry on the Forest,
Subject to Valid Existing Rights

| Area | Acres | |
|---|---|---|
| Withdrawn: | | |
| Trinity Alps Wilderness | 28,590 | |
| Siskiyou Wilderness | 21,670 | (excludes lands in Smith River NRA) |
| Yolla-Bolly Middle Eel Wilderness | 11,100 | |
| North Fork Wilderness | 8,260 | |
| Smith River National Recreation Area | 305,170 | (includes part of Siskiyou Wilderness) |
| Wild segments of Wild | 4,530 | (excludes lands in Smith River NRA & Scenic Rivers & Wildernesses) |

| | | |
|---|---|---|
| Administrative and Recreation sites | 1,518 | (excludes sites in Smith River NRA) |

Acquired Lands:

| | |
|---|---|
| Northern Redwood Purchase Unit | 1,240 |
| Humboldt Nursery | 210 |
| Lookout Sites | 20 |

Congressionally designated areas such as wilderness, the Smith River NRA, and Wild Rivers are withdrawn from mineral entry by the Act designating them. These areas are shown on the Recreation Resource Map for Alternative Current, which is part of this EIS. Wild river withdrawals from mineral entry correspond with the corridor width.

Some lands managed for administrative and recreation purposes have been withdrawn from mineral entry by the Secretary of Interior at the request of the Forest Service. Secretary of Interior withdrawals in the Smith River NRA were superseded by the withdrawals in the NRA Act. The withdrawals outside the NRA are described in Table III-30 and their general locations shown in Figure III-40. The Forest completed review of these withdrawals outside the NRA and recommended to BLM that all be terminated. BLM has a backlog of cases to process and anticipates completing action on these sometime after 1995.

Table III-30.
Administrative and Recreation Sites
Withdrawn from Mineral Entry

| BLM Number | Site | Location | Acres |
|---|---|---|---|
| S 1659 | Tish Tang Campground | HM T07N, R05E, Sec 5 | 90.05 |
| S 1799 | Bluff Creek Rec. Area | HM T10N, R05E, Sec 19 & 30 | 143.56 |
| S 4056 | Red Cap Rec. Area | HM T10N, R05E, Sec 14 & 15 | 70.00 |
| CA 7825 | Panther Creek Admin Site | HM T05N, R04E, Sec 23 | 80.00 |
| CA 7853 | Gold Hill, Station 7 | HM T10N, R05E, Sec 17 | 320.00 |
| CA 7855 | Lone Pine, Station 2 | HM T07N, R06E, Sec 21 | 160.00 |
| CA 7828 | Water Spout Admin. Site | MDM T26N, R11W, Sec 6 & 7 | 40.62 |
| SAC 074030 | Black Rock Picnic Area | HM T07N, R05E, Sec 29 | 25.00 |
| SAC 079492 | Bonda Mine Campground | HM T11N, R06E, Sec 29 | 75.00 |
| | Pearch Creek Campground | HM Sec 32 | 17.50 |
| | Big Bar Campground | HM T10N, R05E, Sec 17 & 20 | 140.00 |
| | Bluff Creek Campground | HM Sec 30 | 39.82 |
| | Gephart Campground | HM Sec 19 | 59.58 |

| | | | |
|---|---|---|---|
| Aikens Campground | HM | Sec 30 | 71.92 |
| Fish Lake Campground | HM | T10N, R04E, Sec 14 | 40.00 |
| Boise Creek Campground | HM | T07N, R05E, Sec 30 | 40.00 |
| Mad River Campground | HM | T01S, R06E, Sec 2 | 35.00 |
| Bailey & Fir Cove Campgrounds | | T01S, R07E, Sec 29 & 33 | 70.00 |

Figure III-40.
Administrative and Recreation Sites Withdrawn from Mineral Entry

Access to withdrawn areas is generally limited to valid rights existing at the time of withdrawal and is restricted to the extent that the integrity of the area involved must be maintained. The specific restrictions for these areas are contained in the Forest Standards and Guidelines, Prescriptions, and Management Area Direction of the Forest Plan.

The Federal Energy Regulatory Commission (FERC) has terminated 16 withdrawals for specific power projects on the Forest, opening the lands to mineral and other forms of entry and disposal. Only one FERC withdrawal is still effective: the licensed hydropower project at Mill and Sulphur creeks. This withdraws lands from mineral and other forms of entry and disposal.

There are 4,398 acres of outstanding mineral rights on the Forest; these are lands received in exchange by the Forest Service where a party other than the one conveying the land to the government owns all or part of the mineral estate. All are within the Smith River NRA: 1,280 acres in the North Fork drainage, 160 acres in the Middle Fork drainage, and 2,318 acres in the South Fork drainage. Maps showing the locations of these outstanding rights are on file in the Minerals section at the Forest Service office in Eureka and at the NRA. It is not known if any of these rights will be exercised during the next 5 decades.

Mineral Occurrences/Supply: Overall mineral production from the Forest is small compared to production across the State and is currently at the lowest level in several decades. In the past, however, the Forest's mineral output has contributed to local development and the local economy.

Gold has been found on the Forest, primarily in placer deposits along the Smith, Klamath, and Trinity rivers and many of their tributaries, and in older, uplifted terrace gravels. Mining has been by ground sluicing, hydraulicking, excavating, and placer-washing, and more recently by suction dredging. Platinum has been recovered as a by-product of placer gold mining in some areas.

Other locatable mineral commodities that have been mined or explored for include chromite in scattered deposits throughout much of the Forest, copper at Low Divide in the Smith River NRA and at Horse Mountain on the Lower Trinity district, manganese and asbestos within the Mad River district, limestone and silicon on the Lower Trinity district, and cobalt, nickel, and mercury on and around Gasquet Mountain in the NRA.

Mineral exploration conducted during the late 1970s and early 1980s indicated the presence of a possible cobalt and nickel ore body covering some 3,000 to 5,000 acres near Gasquet Mountain. The grade of this ore is lower than that of ore currently being mined in other parts of the world (Nycal Corp., comments on DEIS, 1994). Laterite deposits found elsewhere in the world may be

located where infrastructure required for mining is less developed than in this area (Nycal, 1994), but state and federal standards for clean air and clean water and protecting threatened, endangered, and sensitive plant and wildlife species and other surface resources are estimated to be higher here than in other countries where laterite deposits occur. The Forest has no data with which to assess the value of the laterite ores at Gasquet Mountain or to compare the total costs of development and production of higher grade laterite ores in other countries with development and production of lower grade ores locally. Environmental analyses on Cal Nickel's Gasquet Mountain proposals were not completed in the 1980s partly because the State and federal agencies with review and permitting responsibilities had inadequate data about the proposed projects' waste discharge in order to assess the effects of discharge on water quality. State and federal laws and policies in the 1990s require more stringent environmental protections than in the 1980s; the requirements in the FSEIS ROD for key watersheds such as the Smith River and its tributaries comprise one example of the increased protections.

Asbestos (asbestiform chrysotile and tremolite) has been detected at some locations on the Forest. It may occur naturally in soils and rocks in and adjacent to areas with ultramafic bedrock (serpentine, peridotite, etc.). Preliminary testing during rock crushing, hauling, and placing has detected small quantities of airborne asbestos. The amount of this material found was below levels determined to be hazardous by the Occupational Safety and Health Administration.

No deposits of energy-related minerals (petroleum, coal) or geothermal steam have been found on the Forest.

Common variety mineral materials that occur on the Forest include various earth construction materials such as rock for crushed aggregate, riprap, sand, gravel, and decomposed granite. Most sand and gravel deposits are located along streams and are usually replenished periodically by natural deposition. The supply of sand and gravel is expected to be sufficient to meet local needs in the foreseeable future.

Lower Trinity district has 5 sites where members of the public can obtain small quantities of sand and gravel: Big Rock (averaging 2,720 metric tons annually), Sandy Bar and Hawkins Bar (18 metric tons each), and Kimtu Bar and Tish Tang Bar (4.5 metric tons each) for a combined average of 2,765 metric tons of mineral materials available each year.

Orleans district has seven areas where cobbles, sand, and gravel are deposited on accessible unvegetated flood terraces adjacent to the Klamath River that have been used at various times for small material sales: Bonda Mine Bar, Dolan's Bar, east side of Orleans Bridge, Big Rock Bar,Ullathorne Bar, Big Bar, and Aiken's Bar. These sites have an estimated combined average of 980 metric tons of material available each year.

Rock aggregate for road surfacing material is a non-renewable resource. Most of the rock currently being quarried is used for local timber access roads and state and county highways. Most of this rock is moderately to highly weathered and of good to marginal quality, and is expected to be adequate to meet the road surfacing needs for the Forest transportation system. All known rock sources for the Forest have been inventoried and mapped; these deposits are distributed throughout the Forest.

Mining Claims and Activities: The number of mining claims in the NRA considered to be current (BLM filing and/or fee requirements met) dropped from over 2500 in December, 1990, to approximately 300 in January, 1994; Nycal held 236 of these NRA claims, one “partnership” held 34 placer claims, two “partnerships” held 10 claims each, and 16 individuals or “partnerships” held the other 27 claims. All claims in wild river segments outside the NRA and in wilderness have been closed.

The principle mining-related activities occurring on the Forest in the recent past were small scale placer gold operations, suction dredging within the Trinity, Klamath, and Smith river beds for gold, and prospecting and exploratory work at various locations in the Smith River NRA for nickel, cobalt, gold, platinum, and chromite deposits. Ongoing small scale operations consist of two in the Head Camp area of Camp Creek (Klamath River tributary), two in the Klamath River, two in the headwaters of North Fork Mill Creek (Trinity River tributary) and one in the Trinity River east of Hawkins Bar.

The Forest received or administered 10 to 25 Plans of Operation and 45 to 65 Notices of Intent each year from the early 1980s until 1992. More than half the Plans of Operations filed each year were in the Smith River NRA. Most of the operations were for suction dredging for weekends or vacation periods. Twenty-two plans and notices were filed in 1993; 12 were for claims in the NRA.

The only commercial scale operation known to have occurred in the NRA since the 1950s was in the late 1980s on Hurdygurdy Creek to reprocess previously mined tailings; those claims have since been abandoned. The only other approved commercial operation, a 1984 Cal Nickel demonstration project, was halted in 1985 when it was determined that the Environmental Assessment which had been completed did not meet NEPA requirements; federal, state, and local agencies did not receive the additional data to complete an appropriate NEPA analysis, and resumption of operations was not approved.

All known abandoned mines on the Forest have been investigated for hazardous material cleanup under CERCLA (Comprehensive Environmental Response Compensation and Liability Act of 1980). All the sites were found to conform with CERCLA and RCRA (Resource Conservation and Recovery Act of 1976). Some work for sediment control is being done on the mines under the Clean Water Act.

In the last decade, the demand for common variety mineral materials was primarily for use by the Forest. In the early 1980s, the Forest issued on the average from 5 to 20 mineral material permits per year for 2,000 to 11,000 tons (1,815 to 9,975 metric tons) of material (principally sand and gravel). In addition, the Forest issued 2 to 6 free-use permits per year to governmental agencies for 5,000 to 20,000 tons (4,535 to 18,140 metric tons) of road aggregate, sand, gravel and other materials. Forest Service use averaged between 500,000 and 800,000 tons (453,500 to 725,600 metric tons) of aggregate, fill, sand, and gravel, or more than 25 times the amount the Forest has disposed of by sale or free-use. The demand for mineral material sales and free-use permits has remained fairly steady, while in-service need has decreased markedly due to fewer miles of road being built. In 1989, the Forest Service used 1,150 tons (1,043 metric tons) of construction material; 100 tons (91 metric tons) in 1993.

Opportunities

The potential for mineral development has been mapped for the Forest, based on available information such as known mineral resource occurrences, past or present mineral-related activities, mining claim locations, geology, and existing withdrawals. Figure III-40 shows the Forest's potential for mineral development. Table III-31 defines each of the mineral development potential categories and estimates the number of acres within each category.

Figure III-41.
Mineral Development Potential

Table III-31.
Acres of Forest Land by Mineral Development Potential Rating

| Mineral Development Potential Rating | Description | Forest Acres (Percent of Total Forest) |
|---|---|---|
| Very high | Includes areas with active mines. Mineral development will take place during the planning horizon within at least a portion of the area. | 9,800 ( 1%) |
| High | Does not include areas with active mines, but mineral development will take place during the planning horizon within at least a portion of the area. | 82,580 ( 9%) |
| Moderate | Mineral development is expected to occur within at least a portion of the area during the planning horizon. | 242,840 (25%) |
| Low | Mineral development may take place during the planning horizon within at least a small part of the area. Includes areas withdrawn from mineral entry, where future mineral development will only be where prior existing rights have been established. | 380,780 (40%) |
| Probably Low | Based on existing data, the area appears to have a low potential, but the data base is inadequate to classify the area without question as low. Mineral development is not anticipated to occur during the planning horizon. | 242,340 (25%) |

Future demand for minerals from the Forest will depend on market conditions in combination with the cost of mineral exploration, extraction, and processing. This demand is hard to forecast due to the number of variables, but certain near-term market trends indicate a general rise in the price of mineral commodities with a resulting increase in exploration and possibly development. The Forest Plan may have an effect on demand through the conditions or mitigation measures that may be placed on mineral operations, thereby increasing the cost to mine. Management of riparian ecosystems has become a driving issue for this Forest that will require operating plans for all mining

within Riparian Reserves. These operating plans will require coordination with Federal and State agencies, measures to mitigate the effects of operations on Riparian Reserves, reclamation, and reclamation bonding. Effects on supply resulting from the Forest Plan are related to the acres available for mineral entry.

The potential for occurrence of chromite, copper, cobalt, and nickel within the Smith River NRA is particularly important because of the critical and strategic significance of these minerals. The United States imports a very large percentage of its chromium, cobalt, and nickel, and the value of these commodities may rise within the planning horizon. Much of the area containing a potential for the occurrence of these minerals lies within the Smith River NRA, where mineral development is prohibited, subject to valid existing rights.

No claims in the NRA have yet been determined to have valid existing rights. Examining claims to confirm valid existing rights, analyzing data, and preparing reports is a lengthy process. Current funding levels cover two to three claims per year. Mineral examiners have completed field examinations and reports on two claims; one was declared abandoned and void for failure to pay holding fees, and BLM has issued a complaint against the holders on the other.

It is estimated that the potential for mining strategic minerals in the NRA under current laws, regulations, and policies is low. The claims must first be determined to have valid existing rights. After a conclusion is made that valid existing rights exist on a claim, the environmental effects of proposed operations must be analyzed and mitigated under NEPA before operations are approved. It is possible that Congress would enact special legislation to allow mining strategic materials under relaxed rules in the event of national emergency.

Areas may be considered for withdrawal from mineral entry if resource protection laws and regulations would not adequately protect them from the effects of mining. The need to recommend withdrawing Research Natural Areas, Special Interest Areas, and Native American Cultural Use Areas from mineral entry will be considered as these areas are evaluated through management area or site-specific analysis. Where mineral development potential is low and mining has not been a historical use of an area, there should be minimal need to recommend withdrawals.

The demand trend for common variety minerals will likely continue at least through the next few decades. Community sites will be designated on the Orleans district for sand, gravel, and cobble extraction (FSM 2854); additional sites may be considered for designation on the Lower Trinity and Mad River districts.

Affected Environment in Context with Alternatives

Much of the concern about the effects of mining is related to cultural and religious sites or to potential large scale surface mining operations. Effects of mining on cultural and religious sites will be addressed in the NEPA process associated with preparation of implementation plans for Native American Contemporary Use Management Areas (NACUAs); withdrawal of these areas from the effects of the mining law may be recommended as a result of the NEPA review. Designation of the Smith River NRA has reduced the potential for large scale surface mining of cobalt and nickel in the Smith River drainage to low. The project-level NEPA process addresses the effects of mining operations and prescribes mitigation measures appropriate for the specific site prior to approval of

operating plans. Monitoring of mineral activities is addressed in Plan Chapter 5 and would also be addressed at the project planning level.

The potential effects of Forest management direction on mining activities are essentially the same for all alternatives and are not discussed further in Chapter 4.

## RANGE MANAGEMENT

### Public Issues

Issue 22 How should the Forest manage the range resource?

### Introduction

Range management is a discipline that deals with the use of rangelands and range resources for many purposes. These purposes include grazing by livestock and wildlife, wildlife habitat, watershed, recreation, and aesthetics.

Historically, when livestock began grazing on public land, resources other than forage were of little management concern. Livestock grazing on public land reached its peak during the late 1800s and declined over the next 50 years. The decline in permitted stock on public land was largely a result of reduction of livestock numbers (primarily sheep) to achieve proper stocking rates and more reliance on family-owned ranching operations. The Forest provides rangeland for livestock operations on the Lower Trinity and Mad River ranger districts. There are no range allotments on the northern half of the Forest due to the scattered and sparse nature of suitable rangelands and generally steep terrain.

### Current Situation

The Forest currently makes available 12,043 AMs (animal-months) for approximately 1,987 cattle. There are no longer any sheep allotments on the Forest. The range management system is typically season-long grazing. The length of the grazing season varies by allotment location/elevation, but is generally between April and October (see Table III-32). The Forest's range strategy is extensive management of both rangeland and livestock. Under this strategy, devices such as fencing and water developments are used to uniformly distribute the livestock in order to minimize the impacts on other Forest resources.

Of the approximately 297,000 acres of National Forest System (NFS) land in allotments, about 25 percent is suitable. Seventy-five percent of the NFS land in allotments is designated as unsuitable because of steep slopes, lack of forage, and dense timber. Suitable rangeland consists primarily of transitory (10 percent), annual grassland (16 percent), oak woodland (61 percent), and browse (12 percent). Assuming that all the land suitable for grazing is actually made available, up to 21,825 AMs could be realized. This figure consists of 2,206 AMs from transitory range and 19,619 AMs from primary and secondary range. These outputs assume: 1) 1,200 pounds of forage is required per AUM (animal-unit-month); 2) each AM is equal to 1.32 AUMs; 3) 50 percent of the current annual growth is reserved for plant viability; 4) AMs to maintain the deer population are taken into account;

and 5) a 75 percent reduction to transitory range is applied due to intensive timber management practices.

Primary range consists of meadows and grasslands. Secondary range consists of open types to open-timber/bunchgrass types on slopes under 40 percent. Most transitory range exists as a result of recent logging or other timber management activities.

Table III-32 shows range allotments and units, the District they occur on, season of use, AMs recommended in the Allotment Management Plan (AMP), AMs allowed under all types of grazing permits during the 1993 grazing season, year the current AMP was signed, and permit types in effect during the 1993 grazing season.

Timber management activities have opened up the overstory tree canopy, allowing the establishment of grasses, forbs, and browse. Transitory range is available for use by livestock within the first 20 years after regeneration harvest or other tree canopy removal measures. Reductions in timber harvest levels, as well as changes in silvicultural systems, will result in fewer acres of transitory range. The amount of AMs available will be less over time.

The rangeland on the southern two districts of the Forest is divided into 18 separate allotments, 14 of which are currently being utilized at or below established stocking levels. Twelve of the 18 allotments are located on the Mad River district, 6 on the Lower Trinity district. Nineteen permittees utilize the range resource to further their ranching operations. Seven of the 19 permittees operate on the Mad River district utilizing about 90 percent of the AMs permitted on the forest. On the Lower Trinity district, 12 permittees utilize 10 percent of the Forest AMs.

During the 1993 grazing season, livestock utilized 7,613 of the 12,043 AMs made available by the Forest. A total of 6,865 of the utilized AMs were attributable to National Forest System lands. Table III-33 depicts recent range use and receipts.

Table III-32.
Range Allotments, Seasons of Use, and Animal Months, 1993

| Allotment/Unit | District | Season of Use | AMs Recommended | AMs Permitted | Year AMP Signed | Permit Type |
|---|---|---|---|---|---|---|
| Bluford Creek | Mad River | 5/16 - 10/31 | 138 | 138 | 1979 | Term |
| Buck Mountain | Mad River | | | | 1984 | |
| - North | | 5/01 - 10/31 | 192 | 0 | Vacant | |
| - West | | 5/20 - 10/31 | 343 | 343 | Temp | |
| Bug Creek | Lower Trinity | | | | 1962 | |
| - Simpson Exchange | | 5/15 - 11/30 | 195 | 150 | | Term |
| - Bug Creek | | 7/01 - 10/30 | 480 | 0 | Vacant | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Eightmile | Mad River | 5/16 - 10/31 | 2153 | 825 | 1984 | Term | |
| Grouse Mountain | Lower Trinity | 6/01 - 9/30 | 320 | 144 | 1962 | Temp | |
| Groves Prairie | Lower Trinity | 6/01 - 10/15 | 72 | 50 | 1965 | Term | |
| Hoaglin | Mad River | 5/01 - 10/31 | 180 | 210 | 1966 | Term | |
| Hobart Creek | Mad River | 5/16 - 10/31 | 248 | 0 | 1962 | Vacant | |
| Lake Mountain | Lower Trinity | 6/01 - 9/30 | 64 | 0 | 1965 | Vacant | |
| Long Ridge | Mad River | | | 1961 | | | |
| - North | | 5/01 - 10/31 | 144 | 60 | | Term | |
| - East | | 4/16 - 10/31 | 108 | 104 | | Term | |
| - East | | 4/16 - 10/31 | 132 | 52 | | Private | |
| - Lower Salt Creek | | | 5/01 - 10/31 | 102 | 96 | | Term |
| - Upper Salt Creek | | | 4/01 - 10/31 | 291 | 133 | | Term |
| - Upper Salt Creek | | | 4/01 - 10/31 | 98 | 98 | | Private |
| Mill Creek | Lower Trinity | 7/16 - 9/30 | 112 | 45 | 1965 | Term | |
| " | 7/16 - 9/30 | * | 38 | | Term | | |
| " | 7/16 - 9/30 | * | 45 | | Temp | | |
| Norris | Mad River | | | 1962 | | | |
| - Pine Butte | | 5/10 - 10/31 | 710 | 171 | | Term | |
| - " | | 5/10 - 10/31 | * | 51 | | Term | |
| - Lamb Gap | | 5/10 - 10/31 | 160 | 0 | | Vacant | |
| - Devils Ridge | | 5/10 - 10/31 | 125 | 0 | | Vacant | |
| - Pickett Peak | | 5/10 - 10/31 | 330 | 0 | | Vacant | |
| Pine Mountain | Mad River | 6/01 - 10/31 | 88 | 75 | 1962 | Term | |
| Soldier | Mad River | 4/16 - 5/31 | 127 | 0 | 1985 | Vacant | |
| Trinity Summit | Lower Trinity | 7/16 - 9/30 | 389 | 63 | 1962 | Term | |
| " | 7/16 - 9/30 | * | 58 | | Term | | |
| " | 7/16 - 9/30 | * | 58 | | Term | | |
| " | 7/16 - 9/30 | * | 58 | | Term | | |
| Van Duzen | Mad River | | | 1962 | | | |
| - Crooks Ridge | | | 5/10 - 10/31 | 374 | 171 | | Term |
| " | 5/10 - 10/31 | * | 205 | | Term | | |
| - Green Mtn. | | 5/15 - 10/31 | 495 | 275 | | Temp | |

Table III-32.continued

Range Allotments, Seasons of Use, and Animal Months, 1993

| Allotment/Unit | AMs | AMs | Year AMP | Permit | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | District | | Season of Use | Recommended | | Permitted | Signed | Type | |
| Van Horn | Mad River | | | 1982 | | | | | |
| - Barry Creek | | 6/01 - 10/31 | 625 | 625 | | Term | | | |
| - Barry Creek | | 6/01 - 10/31 | 203 | 185 | | Private | | | |
| - Three Forks | | 6/01 - 10/31 | 625 | 625 | | Term | | | |
| - Red Mtn. North | | 4/16 - 5/31 | 115 | 69 | | Term | | | |
| - Red Mtn. North | | 9/05 - 10/04 | * | 46 | | Term | | | |
| - Red Mtn. North | | 4/16 - 10/31 | 135 | 135 | | Private | | | |
| - Red Mtn. South | | 3/01 - 4/15 | 180 | 180 | | Term | | | |
| - Red Mtn. South | | 10/05 - 11/05 | 120 | 120 | | Term | | | |
| - Rock Creek | | 4/16 - 10/31 | 429 | 429 | | Term | | | |
| - Rock Creek | | 4/16 - 10/31 | 221 | 221 | | Private | | | |
| - Upper Mad River | | 6/01 - 10/31 | 690 | 690 | | Term | | | |
| Zenia | Mad River | | | 1962 | | | | | |
| - North | | 6/01 - 10/31 | 150 | 250 | | Term | | | |
| - South | | 5/10 - 10/15 | 250 | 265 | | Term | | | |
| - South | | 5/10 - 10/15 | 130 | 57 | | Private | | | |
| | Totals | | 12,043 | 7613 | | | | | |

* recommended AMs included in above figure

Table III-33.
History of Range Use

| Year | Allotments Active | Permit Total | Actual Holders Active | Total | Uses (AMs) | Receipts (Dollars) |
|---|---|---|---|---|---|---|
| 1980 | 16 | 18 | 25 | 25 | 6,939 | 20,466 |
| 1981 | 16 | 18 | 25 | 25 | 6,703 | 18,045 |
| 1982 | 17 | 18 | 24 | 25 | 7,911 | 15,535 |
| 1983 | 17 | 18 | 24 | 25 | 8,987 | 12,947 |
| 1984 | 17 | 18 | 24 | 25 | 9,242 | 12,813 |
| 1985 | 16 | 18 | 24 | 24 | 9,439 | 13,145 |
| 1986 | 16 | 18 | 22 | 23 | 8,229 | 11,557 |
| 1987 | 17 | 18 | 22 | 24 | 7,512 | 9,604 |
| 1988 | 15 | 18 | 19 | 22 | 6,722 | 10,827 |
| 1989 | 15 | 18 | 19 | 19 | 6,498 | 12,641 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1990 | 14 | 18 | 19 | 19 | 6,505 | 12,133 |

The ecological condition of the rangelands on the Forest is not known at this time. Traditionally, condition and trend ratings have primarily been conducted on California annual grasslands; however, condition and trend concepts are not applicable to California annual grasslands. As a rule, if the residual dry matter on an annual grassland is adequate, the condition and trend is correct. Current management intent is to complete ecological classification of rangelands and to determine condition and trend, where applicable.

There are active range allotments in three wildernesses. These areas provide approximately 584 AMs of forage: 210 AMs from the North Fork Eel, 180 AMs from Yolla Bolly-Middle Eel, and 194 AMs from the Trinity Alps.

There is approximately one-quarter mile of fence within the North Fork Wilderness and two water troughs within that portion of the Yolla Bolly-Middle Eel Wilderness located on the Mad River district. A corral, cabin, and spring development are located within the Trinity Alps Wilderness on the Lower Trinity district. The cabin serves as a base for wilderness/range patrol personnel. All of these improvements were in use when the areas were designated as wilderness.

Past and current problems associated with livestock use include grazing within riparian areas and construction of roads that cause range allotment management problems such as a need to install fences, gates, and cattleguards.

Within the suitable rangelands that are grazed by livestock, there are perennial and intermittent streams, ponds, springs, and wet meadows. Even when upland areas are in good condition and are being grazed at the proper season and intensities, these wet areas, known as riparian areas, can be overgrazed. There are few grazed riparian areas on Six Rivers. Where riparian areas are over-utilized, one solution used is a riparian pasture. Approximately 100 acres of riparian and upland have been fenced on Salt Creek, and the numbers of cattle and amount of use are controlled.

Grazing in riparian zones can result in loss or conversion of vegetative cover and degradation of stream channels. Livestock effects upon riparian zones needs to be minimized. Current management intent is to inventory riparian areas, identify condition, and implement corrective measures where needed.

Opportunities

The demand for Forest rangelands is expected to remain at current levels over the next decade. Any increased demand for rangeland could likely be accommodated by the 4,430 AMs which are currently made available but are not utilized. There is little opportunity to improve forage production in a cost effective manner. Increases in demand for AMs beyond this level could best be accommodated through the use of sheep. However, there are currently no sheep allotments on the Forest.

The improvement of vegetative conditions and damaged riparian areas could be expedited by improved management practices such as shifting or establishing grazing systems, fencing, water development, range riders, and changing allotment boundaries.

Additional information is needed with regard to the current and potential utilization of the complex plant communities found on the Forest in order to more efficiently manage the range and riparian resources. The Pacific Southwest Region has initiated a project to provide an ecological classification of all forest plant communities. This classification will distinguish significant differences in components, succession, productivity, and response to management activities. The Ecosystem Classification Project will facilitate identification and interpretation of vegetation-soil communities at the project level of planning.

Since the departure of sheep herding on the Forest, predation has generally not been a problem. Mountain lion and bear do occasionally prey upon cattle. If it is determined that livestock or wildlife need protection from predators, the Forest will cooperate with Animal and Plant Health Inspection Service (APHIS) and California Department of Fish and Game.

With the increasing numbers of people living within and adjacent to Forest land, the potential for conflicts with livestock is rising. Livestock permittees should not deliberately and intentionally cause their permitted livestock to trespass on private lands that are not owned or leased by them. Knowing that livestock turned out onto Forest Service administered lands may stray onto private land is not considered intentional and such intrusions are not considered a violation of grazing permit terms and conditions. In addition, the Forest Service is not responsible for the intrusions nor for the settlement of disagreements between the permittee and land owner.

Figure III-42. Typical grazing activity on a range allotment on the Mad River Ranger District.

Affected Environment in Context with Alternatives

The potential effects of Forest management direction on the range resource and range management are essentially the same for all management alternatives and are discussed further in Chapter 4. The potential effects of specific projects on range management will be considered during the project-level NEPA process.

## RECREATION PROGRAM MANAGEMENT

### Public Issues

Issue 23 How much of the Forest will be opened to off-highway vehicles?

Issue 24 How many miles of trail will be constructed and maintained on the Forest?

Issue 25 How will more recreational opportunities be provided?

### Introduction

During public input, many people felt that additional recreation developments should occur and noted the potential benefits to local and regional economies. Others felt that the Forest should keep certain areas that are currently undeveloped ‘as is’ with no new development. There was concern that the sites need a higher level of maintenance and that facilities need to be upgraded.

Most people who provided public input felt that the trail system should be expanded and better information about these trails should be made available. There was also some interest regarding the maintenance of historic trails on the Forest. There was concern about trails being dropped from the Forest system over time. There also was support for Undeveloped Dispersed Recreation areas (UDRs), and some individuals suggested additional areas for UDRs. There was concern about maintaining the existing character of non-developed areas and semi-primitive areas. Much of this concern centered around the issue of maintaining a certain quality of the recreation setting.

The off-highway vehicle (OHV) issue generated considerable public response. While the extreme views of ‘no OHV use’ versus ‘uncontrolled OHV use’ were voiced by some, most people regarded the use of OHVs as acceptable given proper management constraints and restrictions. OHV proponents felt their needs should be recognized and that such use can be compatible with other Forest uses. Some people indicated a need for more OHV opportunities and had a concern over the decline of opportunities over the years. Many felt that it is a legitimate use of public lands. The recurring theme in the comments about OHV use was: the use of OHVs should be regulated and controlled to protect sensitive areas and reduce potential conflicts.

Current Situation

The Six Rivers National Forest provides a diverse array of land- and water-based recreation opportunities. Of exceptional merit are the opportunities generated by its many rivers, streams, and creeks which comprise 35 percent of the state’s Wild and Scenic River System contained within National Forest System lands. Much of the recreation that occurs is focused around the major river systems that transect the Forest: the Smith River and its forks, the Klamath, the Trinity, the Mad, and Ruth Reservoir on the Mad. Additionally, over 60 lakes and ponds, mostly within the Orleans district and the Siskiyou Wilderness, provide opportunities for a range of water-based activities. Collectively, these water resources offer unique settings that attract users for recreational fishing, rafting, canoeing, kayaking, sunbathing, snorkeling, scuba diving, waterskiing, windsurfing, sailing, jet skiing, floating, and swimming; wildlife and bird watching; gold panning; and enjoying scenic beauty.

Many of the Forest’s recreation facilities have been developed in these water corridors since they function as attractions for people seeking outdoor recreation experiences. Major state highways or county roads parallel these water resources and provide convenient access to users. Other recreation opportunities are dispersed throughout the Forest and are both land- and water-based. With a diverse terrain and variety of habitats, land-based recreation opportunities are just as abundant as those dependent on water. Opportunities available are camping, hiking, recreational stock use, mountain biking, motorized recreation, hunting, rock climbing, picnicking, snowplay, crosscountry skiing, historical and archaeological sites, rock collecting, interpretive sites, nature study, photography, woodcutting, Christmas tree cutting, stargazing, wildflower and wildlife viewing, scenic driving, recreation special events, and more. These other opportunities are often dependent upon the road or

trail transportation system since the terrain in many places is too rugged to afford easy cross-country travel by foot or hoof.

The Forest is cooperatively marketing these many opportunities and facilities with other local and regional state and federal agencies, as well as tourism organizations. The abundance of natural attractions in the northcoast area is impressive and rivals any other area of the state. Because of the relative remoteness of the area, many people are unaware of what the area offers. By cooperatively showcasing the entire range of recreation, cultural, and historical opportunities available within the area, potential tourists will hopefully be encouraged to visit the area for longer periods of time.

There are certain nodes or landscape features, such as open grassy glades, dispersed throughout the Forest that also attract users for camping, picnicking, and hiking. While facilities such as campgrounds are provided in some places, the main attraction has to do with the quality of the outdoor setting. Users who desire an even more primitive recreation setting have the opportunity for such experiences in any of the four designated wildernesses - Siskiyou, Trinity Alps, North Fork, Yolla-Bolly. Primary attractions in most cases are the natural resource itself and the opportunity for solitude.

The dominant socio-demographic characteristic of the Forest is its relative remoteness. The northern California coastal area is sometimes referred to as the “lost coast” due to its relative isolation. There is no metropolitan area within a four hour drive (or within 200 miles) which has a population of over 1,000,000.

Congressional legislation in 1990 created the Smith River National Recreation Area, a 305,000-acre tract within the northern portion of the Forest, which encompasses the nation’s largest component of the Wild and Scenic Rivers System. National and regional exposure could significantly increase recreation use demands on this area. Cooperative marketing efforts with neighboring state and federal agencies and with local and regional tourism organizations and agencies are underway to increase awareness of the state’s newest national recreation area. Refer to Appendix A in the Forest Land and Resource Management Plan for a more detailed discussion of the Smith River NRA. The Smith River NRA Management Plan provides management direction for the area during this planning period. No attempt, therefore, has been made in this document to reclassify the area by Recreation Opportunity Spectrum (ROS) classes (see the discussion of ROS within this section of Chapter 3). Within the Smith River NRA there also is the recently created Smith River National Scenic Byway, one of two scenic byways in the Forest. The Smith River NRA and surrounding area have a wide diversity of public recreation opportunities as a result of several adjacent parks: Redwood National Park and Jedediah Smith, Del Norte Coast Redwood, and Prairie Creek Redwood state parks.

Trends: Historically, the intensity of recreational use on National Forest System lands remained low until after World War II. Beginning with the end of World War II, America experienced an explosion in outdoor recreation use that culminated in the mid-1970s. In the 1940s the nation was still shifting from a rural orientation to a more urbanized, industrialized society. The average work week declined to 40 hours, and most workers had a 2-day weekend for leisure activities. Americans also had more disposable income to spend for recreation pursuits as personal and family income rose. Access to recreation resources was easier with more cars, inexpensive fuel, and better highways. People began taking more trips, but these evolved into shorter excursions taken closer to home.

Today there is a trend to prefer more comfortable and “modern” facilities and services, along with a readiness to pay for quality outdoor experiences. People are taking shorter, more frequent vacations or trips that are closer to home. There is more frequent use of commercial accommodations by site visitors who have made more distant trips. A large percentage of the visitors to federal areas for overnight recreation trips are using commercial rented accommodations. The overall population trends show a greater number of late middle-aged and elderly people. There are trends toward more family oriented recreation pursuits and an increase in unique “adventure” tours. Modern recreation activities are more diverse and are strongly influenced by technological developments.

In addition, California’s population is growing at a faster rate than the U.S. population as a whole. Between 1980 and 1990 it increased 26 percent, and demographers estimate that between 1990 and 2000 it will increase 29 percent. The average age of California residents is increasing; this change is influencing recreational needs. Many Americans are now more health conscious and may be able to participate in active recreational pursuits much later in life than did previous generations.

Supply and Demand: The prediction of recreation demand, applied to a specific local geographic area, is an inexact science. Recreation experts find it difficult to understand how the range of qualities of the outdoor environment setting affects demand, and how well that demand is being satisfied. Existing use is often looked at as a reflection of current demand, but this ignores the potential latent demand that can be influenced or created by marketing. It is also difficult to predict the technological innovations that spur the demand for a new type of recreation activity or experience. Sailboarding, windsurfing, and mountain bicycling are good examples of new activities unforeseen in previous decades.

Outdoor recreation demand appears to be growing at about the same rate as population. Most of the use on the Forest appears to be locally and regionally based. The population of California grew 26 percent from 1980 to 1990. The counties of Humboldt, Siskiyou, and Trinity (where some of the Forest lands are located) grew at a more modest rate of 10 percent during this same period. However, Del Norte County grew at the rate of 29 percent, perhaps influenced primarily by the construction and staffing of a maximum security State prison outside of Crescent City.

With most of the use coming from these four counties, it seems likely that the growth in recreation use would parallel these growth trends. However, Forest use figures show a 45 percent overall increase in Recreation Visitor Days (RVDs) from 1981 to 1990. (One RVD is an aggregate of 12 hours of recreation use). Use dropped from 660,000 RVDs in 1981 to a 1984 low of 429,000 RVDs, followed by an increase to 954,000 RVDs in 1990. Refer to Table III-34 for a comparison of use from 1984 through 1990 for various types of activity groups. Some of the increase in Forest use may be generated from areas of California and southern Oregon that have experienced higher growth rates.

Table III-34.
Recreation Use Trends in Thousands of RVDs

| Activity Group | 1984 | 1987 | 1990 |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Camping, picnicking, and swimming | 173.7 | 208.9 | 266.7 |
| Hiking, horseback riding, and water travel | 41.8 | 77.0 | 112.7 |
| Hunting | 24.1 | 35.3 | 70.4 |
| Fishing | 83.2 | 88.2 | 99.5 |
| Gathering forest products | 19.7 | 38.2 | 84.5 |
| Wilderness | - | 29.1 | 27.5 |
| Other (motorized rec, viewing scenery, etc.) | 86.9 | 142.0 | 292.7 |
| Total | 429.4 | 618.7 | 954.0 |

Developed Recreation: The Forest Service has provided some facilities and developed sites to enable the public to enjoy and experience the Forest's natural settings. The most common developed sites on the Forest are the campgrounds. The Forest has 15 developed campgrounds for which a fee is charged. This fee ranges from $6.00 to $12.00 a night. Fees are structured and adjusted to be roughly comparable with the private sector so as not to underprice and unfairly compete with the private suppliers of similar recreation opportunities.

Under revised fee legislation of the Land and Water Conservation Fund Act, two additional camping areas which offer fewer amenities now charge a fee of $4.00 a night. In addition to the 15 campgrounds, these are the only fee recreation sites provided by the Forest. The 15 campgrounds have a total of 370 campsites. The total number of campers that can be accommodated at one time is approximately 1,850. The total capacity that can be accommodated during a year varies as the length of the operating season varies. Most are open for a period of four months, and some are open yearlong.

Campgrounds are currently available on a first-come, first-served basis, though Grassy Flat CG sites can be reserved through the national reservation system. Group camping areas can be reserved through local ranger stations. Additional campgrounds, especially those in the Smith River NRA, will be added to the national reservation system. Potential benefits of concession operation of NRA campgrounds and selected others within the Forest will also be considered in the very near future. Most of the campgrounds have volunteer hosts who provide a valuable presence to users, especially first time visitors, of a campground. Most of the campgrounds are relatively small, containing 10 to 50 campsites; the average campground has 30 sites. Most of the sites are rustic in nature, with pressure piped water systems and vault (non-running water) toilets; four have flush toilets, one has showers.

The majority of these sites were designed as single family or small group (up to five people) campsites. While some portions of some campgrounds are designated for larger groups, none were designed to accommodate the needs of such groups. Most of these were designed and built from the period of the 1940s to the mid-1960s. The sites were generally designed to accommodate tent or pickup-camper type camping. The existing facilities often do not match well with the camping styles and needs that have evolved with the majority of campers during the last 30 years, especially the trend toward larger campers, trailers, and motorhomes. Modification efforts will be directed toward allowing some of these campgrounds to accommodate a wider range of users that include those who use recreational vehicles such as motorhomes. Future construction will assess the need for providing facilities for large groups and extended families to meet the changing needs of our diverse publics.

The Americans with Disabilities Act of 1990 is guiding the construction and rehabilitation of recreation facilities. The Forest is committed to providing opportunities, services, programs, and facilities for all recreation users to the highest access level practicable. Three campgrounds in the Smith River NRA have recently been remodeled to provide universal access; this includes the installation of new flush and/or non-flush toilets, picnic tables, fire rings, wider parking spurs, and in one campground, showers. A new boat ramp on the Smith River and a new trailhead into the Siskiyou Wilderness are fully accessible. The other twelve campgrounds are not fully accessible to many segments of the population, but as funds become available, new accessible toilets, picnic tables, and fire rings are being installed. Many of the facilities of these sites have exceeded their original design life and are in need of replacement. Rehabilitation efforts will be directed toward creating greater degrees of accessibility in these sites. Existing sites are being surveyed to determine how they can be modified to provide increased access to physically challenged users.

The Forest has eight other recognized camping areas which have minimal facilities and no potable water systems. No fee is charged for these areas. They are generally small with 3 to 10 “sites;” some have evolved from hunter camping areas. Campground development represents the most intensive facility development on the Forest.

The existing supply of developed camping sites to accommodate up to five people per site exceeds current use. With few exceptions, the use at most of the developed campgrounds is less than 30 percent of the available capacity during the use season. Hopefully, marketing efforts and placing campgrounds on the national reservation system will increase and distribute use of the facilities throughout the year. A few campgrounds do experience relatively high use rates during the primary season because they provide certain quality or site specific opportunities that affect use and demand. Taken as a whole, the available supply of single-family campgrounds within the Forest appears to be sufficient to exceed expected demand levels for the next decade, although there are localized variables that influence demand, and there are also other factors such as marketing that can influence actual use. Facilities specifically designed to accommodate groups ranging from 20 to 100 people or more are needed.

There are few developed day use sites such as interpretive sites, picnic areas, OHV staging areas, equestrian staging areas, trailheads, restrooms, and river access. Since much of the recreation within the Forest is day use and the available supply of day use sites is much less than the current and

projected demand, there is a need for more of these facilities, especially near water where there is good road access and where heavier recreation use is often concentrated.

Dispersed Recreation: Dispersed recreation is a term used by Forest staff for most recreation that does not occur at recognized, developed sites. There is much dispersed recreation occurring on or adjacent to rivers, the Ruth Lake reservoir, Fish Lake, and other water resources.

River recreation opportunities are one of the strongest recreational assets of the Forest and are unrivaled anywhere else in the state. Recreation use along the major rivers peaks during the warmer summer periods when users take to the water for fun and temperature relief. There are numerous undeveloped river access locations. Most of these have few or no facilities; facilities consist primarily of an access road and sometimes a toilet. Usually a four-wheel drive vehicle is needed to maneuver on a river bar. Recreation is very popular along these river bars with people engaging in fishing, swimming, tubing, canoeing, rafting, kayaking, sunbathing, and boating.

There is also a heavy use period along the rivers that corresponds to steelhead and salmon fishing in the autumn. The intensity of this use is directly related to the abundance of the fish that are moving upstream. Bank and wading fishing are popular as are drift and power boat fishing. Power boats range from the small propeller boat to the occasional large jet boat. Jet boats are restricted to certain locations, primarily by water depth and exposed rock.

A moderate amount of recreation opportunities is offered by recreation service partners through outfitter/guide permits, resort permits, and recreation special event permits. These partners in many cases are private business owners who, through permit with the Forest Service, provide an added dimension to the forest recreation experience by their ability to offer personalized guided services, and unique activities that the agency is unable to provide.

There are four special-use permit holders for outfitter/guide operations on the Klamath River issued by the Orleans Ranger District, and these permit holders subcontract to a number of other outfitter/guides. The service provided is primarily for drift boat fishing, with a few jet boats. There are also a number of outfitters with permits issued by the Klamath National Forest who conduct a fair amount of guiding on the Six Rivers portion of the Klamath River. The Lower Trinity Ranger District currently has eight outfitter/guide permits. Four are for fishing, one for fishing and rafting, and three for rafting. Permits issued by the Big Bar Ranger District of the neighboring Shasta-Trinity National Forest are also valid on the section of the Trinity managed by the Lower Trinity RD. On the Smith River, outfitter/guide permits issued are fewer in number due to the fluctuating and, often times, very low river levels. There is one permit issued for guided fishing trips and three for whitewater rafting and kayaking. Some unauthorized use occurs on these rivers and other locations, and the Forest is actively working to rectify these situations as they are brought to light.

Special event permits have been issued for a variety of activities and offer unique opportunities. Some recent examples are a photo shoot, a black powder shoot, to teach river kayaking, a music festival, a bicycle race, and a kayak race. In addition to the outfitter/guide opportunities and recreation special events, the Forest has two resort permits which offer lodging and meals in a unique, rustic forest setting.

Overall, there is ample opportunity to increase the number of permits issued for outfitter/guides as well as special events without significantly impacting the existing recreation experience.

The network of Forest roads, from highly developed and paved roads to steep, narrow timber access roads, provides ample opportunities for users to access remote locations of the Forest. Dispersed, scattered camping occurs throughout the Forest, usually at a location which offers some uniqueness in landform, waterform, or vegetation. Driving for pleasure and viewing scenery accounts for the greatest amount of recreation use on the Forest. A vast majority of activities require the use of motorized vehicles for access.

There are approximately 220 miles of trails, most of which are used for hiking or equestrian activities. Approximately 97 miles are within the 4 designated wildernesses. There are also approximately 37 miles of National Recreation trails, some of which are also within wilderness. There are few specialty trails such as interpretive trails. Trail use is generally light to moderate.

Recreation participation is less during the winter months due to the variability of snow cover. Snowmobile use is very light. The Horse Mountain area is a popular location for winter snow play and cross country skiing, depending upon the amount of snow cover. Winter use in this area is primarily by local residents. The rustic downhill ski area operated at Horse Mountain under special-use permit shut down and the permit was closed due to lack of interest. Lack of a dependable snow cover discourages operation or new development of a downhill system at Horse Mountain.

There is a significant and growing interest in gathering forest products, often undertaken as recreational pursuits. Gathering berries, mushrooms, herbs, basket making materials, and Christmas trees is common on the Forest. In 1990 7,050 permits were issued for cutting Christmas trees for personal use.

Recreation Opportunity Spectrum (ROS): Recreation Resource planning utilizes a concept called Recreation Opportunity Spectrum (ROS). The ROS provides a framework for defining the types of outdoor recreation opportunities the public might desire and provides management direction for various types of opportunities. The ROS system stratifies the land base into various classes of recreation opportunities based on combinations of activities, physical settings, and experience opportunities. There are five basic classes that occur on the Forest: Primitive, Semi-Primitive Non Motorized, Semi-Primitive Motorized, Roaded Natural, and Rural.

Each of these classes is briefly defined in the glossary. In addition there is an ROS Table (Appendix E) that provides guidelines on the setting, experience, activity, social and managerial setting, and size characteristics. Table III-35 represents the inventoried ROS classes, with associated capacities.
Table III-35.
Inventoried ROS Classes

| ROS Class | Acres | RVD 1/ Capacity | PAOT 2/ Capacity |
|---|---|---|---|
| Primitive (P) 3/ | 125,950 | 35,270 | 250 |
| Semi-Primitive Non | | | |

| | | | |
|---|---|---|---|
| Motorized (SPNM) | 42,960 | 42,960 | 430 |
| Semi-Primitive Motorized (SPM) | 63,670 | 76,400 | 800 |
| Roaded Natural (RN) | 716,000 | 1,718,400 | 35,800 |
| Rural (R) | 9,890 | 79,120 | 9,890 |

1/ RVD: one RVD (Recreation Visitor Day) is an aggregate of 12 hours of recreation use
2/ PAOT: Persons at One Time - a unit of measure of capacity
3/ All these areas occur within designated wildernesses or NACUAs

Off-Highway Vehicle Management: In 1979 Six Rivers National Forest implemented the Off-Highway Vehicle Travel Plan. The plan was designed to ensure that the use of off-highway vehicles (OHVs, also sometimes referred to as off-road vehicles or ORVs) would be controlled and directed so as to protect resources, promote the safety of all users, and minimize conflicts among the various users. The OHV plan will be superseded by the Forest Land and Resource Management Plan.

OHV use is just one aspect of motorized recreation. Driving for pleasure and viewing scenery are number one recreation activities in national forests and have been since vehicles became popular in the 1920s. Overall, motorized recreation is on the increase and coordinated efforts at various local, state, and federal levels are using forest roads to increase rural tourism attractions and revenues. Events such as dual-sport motorcycle rides involving several hundred riders using a combination of forest roads and state highways have the potential to become major tourism events in many Northern California rural communities and are on the increase. The California Backcountry Discovery Trail, a major route in the planning stage, will use existing forest roads as well as state and county routes, and will traverse the state. The Forest has two nationally designated Scenic Byways (Smith River Scenic Byway-Hwy. 199 and Trinity Scenic Byway-Hwy. 299), and another one on Highway 36 is proposed. Rural communities are enthusiastically supporting the designation of these routes and motorized events and are promoting them as tourism attractions and potential sources of revenue.

Forest Service Level 2 system roads are available for OHV and other motorized use unless gated or signed closed. These level 2 roads (1,190 miles) offer the primary use opportunities for OHVs. There is also traditional OHV use occurring on a number of non-system primitive roads and routes. An updated OHV route inventory will define an OHV system with specific existing routes mapped and designated. The majority of the OHV use on the Forest occurs in the southern portion of the Forest. The Forest holds a State of California OHV Greensticker Grant for OHV recreation planning. The Forest's OHV Program is in development; additional opportunities for enhancing this recreational activity include the identification and signing of routes, special event planning, user education, monitoring, construction of staging areas, and patrolling.

There are minor problems with illegal use of OHVs occurring off of designated trails, mostly due to non-recreational use of OHVs by hunters, inholders/rural residents, and forest product gatherers.

This is being addressed by an aggressive user education program as well as law enforcement activities. In addition, the Forest is actively signing routes that are open and closed as well as barricading illegal access points. The generally steep forest terrain combined with dense, brushy vegetation also work to keep cross-country travel to low levels. Compliance by recreational OHV users rates very high, as peer pressure and family units exert certain desirable values upon other users.

Opportunities

The large public land base of the Forest provides a very large supply of potential outdoor recreation opportunities. Relative to general dispersed land base recreation, the available supply is suspected to be much greater than the current and projected demand for the next decade. To attach specific numbers to the potential of the existing land base to reflect the amount of use the Forest could potentially supply would be conjectural. More accurately, the Forest could easily absorb three to four times the existing dispersed use without that use effecting a change in the character of the setting.

There are opportunities to improve the facilities at existing developed campgrounds. The installation of flush toilets, larger parking spaces for recreational vehicles, and accessible facilities for persons with disabilities can increase the number and range of campground users.

As much of the Forest's recreational use is driving for pleasure and scenic views, the Forest could increase the number of day-use areas such as roadside rest stops and picnic areas.

Potential exists for increasing the number of outfitter/guide permits and recreation special event permits without significantly impairing the recreation experience sought by recreationists. The number of permits issued forestwide is relatively low. Recreation service partners provide experiences and services much sought after by recreationists who want personalized service offered by knowledgeable guides for various activities. They provide an added dimension to the overall Forest Recreation program.

The available supply of water-based recreation is limited. There are few lakes or reservoirs outside of wilderness, although there are numerous river systems. Demand will continue to be heavy on such water resources for recreation because of the uniqueness and special attraction water holds for most people. Some of the demand relative to the major rivers, for example, is heavily influenced by a quality variable. When the fisheries resource is plentiful, there is a high demand by recreation anglers. As the fisheries supply diminishes, the use may drop significantly but the desire for a fulfilling fishing experience will still exist as a latent demand.

Because so many Forest recreation activities are focused around water resources, there could be potential conflicts between recreation users, Native American uses, and Native American cultural sites. Conflicts can occur between drift boat anglers and bank or wading anglers. The Forest exercises management control primarily by the presence or lack of river access, by the type of access, and the restrictiveness of the access (access only by a four-wheel drive vehicle).

California is the leading state for off-highway vehicle (OHV) use. One in every eight of the nation's motorcycles and all-terrain vehicles were registered in California during 1988. In 1990, a

scientifically defensible study done by CALTRANS found that 14.7 percent of the households surveyed drive at least one of their vehicles off-highway (anytime a vehicle leaves a paved surface it is considered to be off-highway, and hence an OHV; this includes passenger cars and other street licensed vehicles). While the demand has been steadily increasing for OHV use opportunities, the supply of designated OHV routes on the Forest has declined. There are no OHV staging areas or facilities designed to accommodate their use. Opportunities exist to use non-system roads, designate specific routes, increase signing, construct staging areas, and participate in special events.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on recreation are discussed further in Chapter 4. These discussions will address some of the questions raised by the issues identified at the beginning of this section. Other questions related to these issues cannot be addressed in this document but will be addressed through project-level NEPA review.

ROADLESS AND WILDERNESS AREA MANAGEMENT

Public Issues:

Issue 26 How should released Roadless areas (RARE II) be managed?

Issue 27 How will wilderness be managed?

Issue 28 Should the Forest establish additional areas for wilderness management?

Introduction

The amount of proposed wilderness on the Forest was identified as an early public issue. This issue was resolved for this planning cycle by the enactment of the California Wilderness Act of 1984.

Current Situation

Wilderness legislation was first passed by congress in 1964. The Wilderness Act of 1964 [16 U.S.C. 1131-1136] established a National Wilderness Preservation System to be composed of Federally administered areas designated by Congress as “wilderness.” Under the Act, wilderness is defined as “an area where the earth and its community of life are untrammeled by man - where man himself is a visitor who does not remain.” It is further defined as “a unit of undeveloped Federal land that retains its primeval character without permanent improvements on human habitation, which is protected and managed to preserve its natural conditions.” There were no designated wildernesses on the Six Rivers as a result of this Act.

Twenty-three roadless areas totaling approximately 313,000 acres were identified during the roadless area review and evaluation process (RARE II) as potential new wildernesses. A roadless area must be 5,000 acres or larger and substantially undeveloped and natural. The study of these areas culminated with the passage of the California Wilderness Act (PL 98-425) in 1984. This Act and the 1990 Smith River National Recreation Area (NRA) Act together designate approximately 121,000 acres of wilderness on the Forest. The 1984 Act released approximately 190,000 acres of roadless

areas for non-wilderness uses. None of the “released areas” are being proposed for wilderness designation during this round of planning. There were no “further planning” areas for wilderness identified.

Roadless Areas: The debate concerning the best disposition for remaining roadless areas did not end with the passage of the California Wilderness Act of 1984. Appeals and lawsuits over entry into roadless areas show that the management direction for roadless areas is still an issue. As provided in the 1984 Act, the released roadless areas can be managed for multiple-use other than wilderness during the planning period covered by the Plan. Portions of some of these areas have been roaded or are currently being considered for roading under project specific EISs. For more information on the current situation of each of these areas and for information on the disposition of these areas by alternative refer to Chapter 4 and Appendix C (Roadless Area Evaluation).

Forest Wildernesses: The Six Rivers now encompasses all or parts of four different wildernesses as a result of the 1984 Act. These are identified on the alternative maps and described as follows:

Yolla Bolly-Middle Eel: This wilderness was first designated in the 1964 Wilderness Act, entirely on the Trinity and Mendocino National Forests. The 1984 Act added the Big Butte-Shinbone roadless area (about 32,000 acres), including the Yolla Bolly Addition (200 acres). Approximately 11,100 acres of this is within the Forest.

Approximately 11,000 acres of the Big Butte-Shinbone addition to the Yolla Bolly-Middle Eel Wilderness is on the Mad River district and is bordered on the north by Hayden Roughs and Jones Ridge, from which it drops off steeply into the arid, rugged ridges to the south. This area is within the Red Mountain Creek watershed, a tributary of the North Fork of the Eel River. The area is typified by brush and some stands of timber. Past fire has burned over much of this area; the most recent fire occurred in 1987, when approximately 65 percent of the area was burned.

The Yolla Bolly extension on the Mad River district (100 acres) is the small strip of land between the 1964 boundary of the Yolla Bolly-Middle Eel Wilderness and Road 27N01. This strip begins in the area of Four Corners Rock and ends near Little Doe Camp. This area provides two trailheads to the wilderness and is typified by stands of timber and brush.

North Fork: At 8,260 acres, this is the only Wilderness entirely on the Six Rivers National Forest. It is on the Mad River district. The main attractions of this wilderness are its primitive setting and the North Fork of the Eel River (designated a Wild River by the Secretary of Interior in 1981). The terrain of the area is steep and rugged. A large portion of the North Fork consists of south-facing slopes that are covered with grass, manzanita, and scrub oak. Mixed conifer forests predominate on north-facing slopes. Blacktail deer are found within this area, which contains some of the best deer winter range on the district. Although the area has a large number of trails, none of these are maintained at present. The diverse vegetation and terrain offer some challenge to travelers.

Trinity Alps: A portion of the Orleans Mountain “C” roadless area and all of the Red Cap Addition (totalling about 28,590 acres) are now part of the Trinity Alps Wilderness (totalling about 500,000 acres). This Wilderness is shared with the Trinity and Klamath National Forests. The portion of this wilderness on the Forest (approximately 27,600 acres) straddles the line between the Orleans and Lower Trinity districts.

Physical features of the Orleans Mountain “C” area vary from steep sided, heavily timbered canyons in the southern portion to barren, flat ridges in the north in the headwaters of Mill, Tish Tang, and Horse Linto creeks. The area provides deer summer range and supports high bear populations. Cattle grazing occurs in the area. There are presently two range allotments. About half of the proposed North Trinity Mountain Research Natural Area (RNA) is included in the wilderness. Most use occurs in the northeastern area around the Trinity Summit high country due to gentler terrain. The summit is unique because of numerous meadows, stringers of true fir, alder swamps, shallow cirque lakes, and outstanding scenery. There are several historic and prehistoric sites in the area, as well as historic trails.

The Red Cap Addition is within the Red Cap Creek watershed. Stands of conifers, pure hardwood stands, and extensive brushfields and barren areas are scattered throughout the steep and rugged terrain. Of the several lakes in the area, Red Cap Lake is most popular followed by Black Lake, Lost Lake, and Waterdog Lake. The Salmon Summit, Horse Trail Ridge, and Devil’s Backbone national recreation trails are all within the area. All three trails provide the traveler with a spectacular view of the Marble Mountain Wilderness and the Trinity Alps. The area also has a great deal of cultural value; historic uses continue today.

Siskiyou: Portions of the Siskiyou and Blue Creek roadless areas are now part of the Siskiyou Wilderness (total of about 153,000 acres). This Wilderness is shared with the Klamath and Siskiyou National Forests; the portion within the Forest is approximately 74,000 acres.

The Blue Creek portion of this wilderness is located on the Orleans district and that portion of the former Gasquet district outside the Smith River NRA. It is the southernmost portion of the Wilderness, located about 20 miles inland from the Pacific Ocean and 18 miles northwest of the town of Orleans. Blue Creek and the Crescent City Fork of Blue Creek are the major drainages. The fish habitat was severely altered by the 1964 flood but has recovered considerably. Spawning gravels are infrequent for salmon, but juvenile rearing habitat for steelhead and trout is good to excellent. The terrain for the most part is very steep and rugged, with most of the ridgetops a combination of rocky faces and Figure III-43. The Siskiyou Wilderness is very rugged and of high elevation.

steep, brushy slopes. The elevation ranges from 650 feet to 5,318 feet. There are no lakes in the area.

The Blue Creek area supports a complex mosaic of plant communities: some glades and wet meadows, mixed conifer stands including Port-Orford-cedar, and pure hardwood stands (madrone, tanoak, and chinquapin). Vegetation in this area is dense, whether it be stands of conifers, hardwoods, or brush. This vegetational pattern is attributed to the area’s fire history.

A portion of the Helkau Cultural Resource District is located within this part of the Siskiyou Wilderness. This district has been determined eligible for inclusion on the Register of National Historic Places, primarily because of its past ritual activity. Some activities continue today.

The California Wilderness Act established a corridor for the construction of the Gasquet-Orleans (G-O) Road within this roadless area. This road was not completed. The corridor was closed and the

area included in the wilderness in the legislation creating the Smith River National Recreation Area. The Blue Creek Trail and Forks of Blue Trail are the only Forest Service-maintained trails in the area.

The Six Rivers portion of Siskiyou “A” is broken into two parcels. The northern parcel extends from Broken Rib Mountain (5,824 feet) on the north to Twin Peaks (5,938 feet) on the south, and takes in portions of the upper watersheds of the Middle and Siskiyou forks of Smith River. The vegetation consists of mixed conifers, with extensive low-growing, dense brushfields of manzanita, tanoak, and saddler oak at the higher elevations. The topography is very steep, and the lack of trails in this northern portion limits access to the less steep ridges and upper mountain valleys.

The southern portion of Siskiyou “A” extends from Bear Mountain on the north to Sawtooth Mountain on the south. The upper South Fork Smith River (designated as a wild river) and the Siskiyou Crest make up the west and east boundaries, respectively. As a result of the Smith River National Recreation Area legislation, Prescott Fork of the Smith River was designated as a Wild segment under the Wild and Scenic Rivers Act. The vegetation is similar to that of the northern portion, except for large stands of mixed hardwoods around Jedediah Mountain, Baldy Peak, and Buck Camp Ridge.

The topography consists of steep inner gorges, knife-edge and rounded ridges, open mountain valleys, and sheer rock faces. Unlike the northern portion, this area has good trail access: the South Kelsey National Recreation Trail goes from the South Fork Smith River east to Harrington Lake, and the Boundary Trail follows the Siskiyou Crest from Harrington Lake to Elk Valley.

A small portion of the Helkau Cultural Resource District is included within Siskiyou “A.”

The southern parcel of the Siskiyou “B” roadless area is now part of the Siskiyou Wilderness containing the Eight-Mile Creek and Williams Creek drainages, as well as a portion of the South Fork of the Smith River drainage. As a result of the Smith River National Recreation Area legislation, Eight-Mile, Williams, and Harrington creeks are designated Wild segments under the Wild and Scenic Rivers Act. This area has a high diversity of plant and animal life, including many unique plant communities resulting from the varied topography and climate. There is evidence of glaciation in the high peaks, which provides some outstanding scenery. The area has a small amount of deer winter range and supports large bear populations.

Recreation opportunities in this parcel include hiking and camping on portions of the South Kelsey National Recreation Trail and Summit Valley Trail. The South Fork of the Smith River and Eight-Mile Creek both provide opportunities for fishing. A small portion of the Helkau Cultural Resource District is included within this part of the Siskiyou Wilderness.

Opportunities

Use of the wildernesses on the Forest is estimated to be about 25,000 recreation visitor days per year during the first decade and increasing at the projected population growth rate for the North Coast area of about three percent per decade.

A draft EIS and Management Plan for the Trinity Alps has been prepared by the Shasta-Trinity National Forest with cooperation from the Six Rivers, and it will be released in 1995. Chapter 4 of the Forest Plan contains general management direction for all wilderness and programmatic management direction and standards and guidelines for the Siskiyou, Yolla Bolly, and North Fork Wildernesses under Management Area 1. Wilderness Implementation Schedules have been or will be completed for the Siskiyou, Yolla Bolly, and North Fork Wildernesses; these schedules will be updated annually.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on released Roadless areas are discussed further in Chapter 4.

The potential effects of Forest management direction on wildernesses are essentially the same for all management alternatives and are not discussed further in Chapter 4.

## WILD AND SCENIC RIVERS MANAGEMENT

Public Issue

Issue 29 Will other rivers be assessed for inclusion in the National Wild and Scenic Rivers System?

Issue 30 What will be the boundaries for the rivers in the Wild and Scenic Rivers System?

Introduction

There has been tremendous public interest in the eligibility, classification, and designation of the Smith River and its tributaries as components of the National Wild and Scenic Rivers System, along with the corridor widths of designated segments. Final resolution of this issue came in November, 1990, with Congressional passage of the Smith River National Recreation Area legislation.

The wild and scenic river corridors on the South Fork of the Trinity River are managed under the provisions of the South Fork of the Trinity Wild and Scenic River Management Plan, November, 1992.

There has been continued public interest in assessment and eligibility of streams in addition to those included in the original Nationwide Rivers Inventory of 1980.

Current Situation

There are currently 95.25 miles of designated wild, 42 miles of designated scenic, and 229 miles of designated recreational river on the Forest, for a total of 366.25 miles of rivers included in the national Wild and Scenic Rivers System. In the state of California there are 1,039 miles of wild and scenic rivers on Forest Service land; Six Rivers provides 35 percent of that total.

Congress passed the Wild and Scenic Rivers Act (16 U.S.C. 1271-1287 et seq.) in 1968. The act identified a need to preserve rivers with "outstandingly remarkable" values in a free-flowing condition, and to preserve them and their immediate environments for the use and enjoyment of present and future generations. The Act instituted a National Wild and Scenic Rivers System which could be added to from time to time, and designated the initial components of that system. None of the initial components of the System [Sec. 3.(a)], or potential additions [Sec. 5.(a)], were located within the Six Rivers National Forest.

Eligible rivers can be added to the System by: 1) authorization for inclusion by an act of Congress, or 2) designation in a state wild and scenic rivers act and, upon application of the governor of the state, final approval by the Secretary of the Interior. For a river area to be eligible for inclusion in the System, the stream must be free-flowing and the related adjacent land area must possess one or more "outstandingly remarkable" scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

Every eligible river, if included in the national Wild and Scenic Rivers System, must be classified, designated, and administered under one of the following categories.

1. Wild: 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. Most of these wild river segments are located on public lands.

2. Scenic: Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

3. Recreational: Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Wild segments: No roads or other provisions for overland motorized travel would be permitted in Wild segments. However, one or more inconspicuous roads leading to the river area, for the purpose of providing access, may be permitted. Unobtrusive trail bridges could also be allowed. The cutting of trees would not be permitted except when needed in association with a primitive recreation experience or to protect the environment. New mining claims are prohibited, and mineral activity on claims with valid existing rights must be conducted in a manner that minimizes sedimentation and visual impairment.

Scenic segments: Roads may occasionally bridge the river area in scenic segments. Short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads could be allowed. Consideration would be given to the type of use for which roads are constructed and the type of use that would occur in the river area. A wide range of silvicultural practices could be allowed provided that such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment. New mining claims would be allowed, and existing operations would be allowed to continue. However, mineral activity must be conducted in a manner that minimizes sedimentation and visual impairment.

Recreational segments: Roads paralleling one or both river banks could be constructed in recreational segments. There could be several bridge crossings and numerous river access points. Timber harvesting would be allowed. However, some restriction could apply to immediate river environments to preserve scenic, fish, and wildlife values. New mining claims would be allowed, and existing operations would be allowed to continue. Mineral activity must be conducted in a manner that minimizes sedimentation and visual impairment.

The effect of designation on road construction, timber production, and mining varies by whether the river is classified as wild, scenic, or recreational and whether it is included within the Smith River NRA. Wild, scenic, and recreational rivers and segments within the Smith River NRA are managed according to the Smith River NRA Management Plan.

The State established a California System in 1972 under the California Wild and Scenic Rivers Act (Behr Bill). The Forest Service and the California Department of Fish and Game (DFG) entered into a Memorandum of Understanding on cooperative relationships in handling wild and scenic river matters for the national and state systems in 1976.

The U.S. Department of the Interior, Heritage Conservation and Recreation Service (HCRS), under the authority of Sec. 5.(d) of the Wild and Scenic Rivers Act, was given the task of developing a systematic federal approach to identify a universe of streams that could meet the criteria for national designation, considering a balanced representation of streams by physiographic divisions, provinces, sections, and stream types. The Nationwide Rivers Inventory, Phase I, for the Pacific Southwest Region was completed in March 1980.

The list of streams contained in Phase I was not intended to be final; additions or deletions were expected. See Table III-36, column A, for a list of Phase I inventoried rivers and segments within the Forest.

The Governor of California, in July, 1980, petitioned the Secretary of Interior to include certain segments of the previously designated California Wild and Scenic River System as part of the national system. An Environmental Impact Statement (EIS) had to be completed before the Secretary could act on the petition, and HCRS was assigned this task.

The EIS contained an evaluation which determined eligibility of the petitioned river segments and their proposed classification under the national system. All State designated rivers within the Forest boundary which met the eligibility criteria, and their tentative classification, are listed in Table III-36, column B. These rivers and segments were considered eligible due to their outstandingly remarkable anadromous fisheries and, in the case of the North Fork of the Smith River, its whitewater boating.

The Secretary of the Interior added most of these rivers to the national Wild and Scenic River System under Sec. 2.(a)(ii) of the Act in his decision dated January 19, 1981. Many of the classifications were changed from wild to recreational to reduce the constraint on management activity. See Table III-36, column C, for the miles of stream within the Forest classified by the Secretary’s decision.

Final changes to river designation and classification in the Smith River system came with legislation creating the Smith River National Recreation Area (NRA) on November 16, 1990. Table III-36, column D, reflects these changes and shows the present status of all designated wild and scenic rivers on the Forest.

Opportunities

The rivers within the Forest that are listed in the Nationwide River Inventory but not designated under the National Wild and Scenic Rivers Act are Redwood Creek, that portion of the Van Duzen River above Dinsmore, and the upper one and a half mile of the North Fork of the Eel River. The Van Duzen and North Fork Eel portions were determined to be ineligible for wild, scenic, or recreational status. Detailed analyses are in Appendix D.

Table III-36.
Redwood Creek is approximately 57 miles long. The lower portion flows through Redwood National Park for approximately 21 miles. Less than one-half mile of the upper portion flows through National Forest System land; the remainder flows through private land. Redwood Creek has potential outstanding values; an eligibility determination is deferred at this time pending action by the National Park Service. The National Park Service currently sees no need to recommend Redwood Creek for wild and scenic status because it feels that Park status protects the river. Until such time as the State expresses its interest in the river, the Forest will maintain (during this 10 year planning period) the portion within the Forest in a condition that will not diminish its potential for wild and scenic designation.

The Van Duzen River and the undesignated portion of the North Fork Eel River were determined by the Forest to have characteristics common to the Six Rivers National Forest and, therefore, are not considered to be outstandingly remarkable. These characteristics are better represented by rivers on the Forest within the same physiographic province that have already been designated as wild and scenic rivers.

Public scoping and an eligibility study performed during the development of the final EIS identified nine additional river segments as potential wild and scenic rivers. The segments are shown in Table III-37.

Table III-37.
Potential Wild and Scenic River Segments
within the Six Rivers National Forest

| Potential River Segment | Length (Miles) |
|---|---|
| Blue Creek | 13.0 |
| Copper Creek | 4.5 |
| Crescent City Fork Blue Creek | 12.0 |
| Horse Linto Creek | 16.5 |
| Mad River | 35.0 |
| Pilot Creek | 15.0 |

| | |
|---|---|
| Red Cap Creek | 26.0 |
| Red Mountain Creek | 7.0 |
| Tish Tang Creek | 7.5 |

Total Miles 136.5

Blue and Red Mountain Creeks were determined to have values that would make them eligible for designation. The other segments listed above were determined to have no outstandingly remarkable values and consequently are not eligible for wild, scenic, or recreational status. Refer to Appendix D for analyses of these river segments. Values associated with these rivers or streams and their immediate environments are protected by other Forest standards, guidelines, and policies such as best management practices (BMPs) and standards and guidelines for fisheries, water, riparian areas, and wildlife.

Affected Environment in Context with Alternatives

The stream segments identified in the public scoping process as potential streams for inclusion in the Wild and Scenic Rivers System were assessed and only Blue Creek was found to have values that would make it eligible for designation. As a result of additional river segment analyses, other streams have also been found to have values that would make them eligible for designation. These segments are discussed further in Chapter 4.

Boundaries of designated streams or stream segments within the Smith River NRA are identified in the NRA management plan and do not vary by alternative. Boundaries for the other designated streams, including those within the NRA exclusions, vary by alternative and will be discussed further in Chapter 4. See Resource Maps 1-3 for the wild, scenic, and recreational river boundaries for each alternatives.

TIMBER MANAGEMENT

Public Issues

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities?

Issue 31 How will hardwoods be utilized?

Issue 7 How will vegetative diversity be maintained Forest-wide?

Current Situation

Allowable Sale Quantity (ASQ): The Multiple-Use Sustained-Yield Act of 1960 provides for “the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forests without impairment of the productivity of the land.” The National Forest Management Act of 1976 limits the sale of timber from each National

Forest to a quantity equal to or less than the quantity which can be removed from the forest annually in perpetuity on a sustained-yield basis. The maximum quantity of timber that may be annually sold by a National Forest under the sustained, non-declining yield principle is termed the allowable sale quantity (ASQ). The allowable sale quantity and the amount of timber sold on Six Rivers have varied considerably. The following is a brief history:

Small amounts of timber were harvested from the Six Rivers National Forest from its creation in 1947 through 1953. The average annual harvest from 1954 through 1962 was 84 million board feet (MMBF). The Mad River Working Circle Plan of 1959, Del Norte Working Circle Plan of 1961, and Humboldt Working Circle Plan of 1962 together established an annual Forest harvest level of 160 MMBF. A series of Working Circle Plan amendments from 1963 to 1968 increased the annual harvest level to 198 MMBF.

The creation of Redwood National Park in 1968 resulted in a net reduction of 1.1 billion board feet from the private timber inventory. The inclusion of the Northern Redwood Purchase Unit for exchange in the Park legislation resulted in a decrease of 18 MMBF annually from the Six Rivers harvest level, leaving the annual cut at approximately 180 MMBF.

The Timber Management (TM) Plan for the Six Rivers National Forest, approved in 1971, provided for a harvest level of 204 MMBF per year and for an average rotation age of 140 years applied to a timber management land base of 477,600 acres. This plan had an expected life of 10 years, or through 1980. Based on legal action by the Sierra Club, the TM Plan was amended in 1976 to increase the average rotation age to 150 years and reduce the ASQ to 190 MMBF. In response to further legal action by the Sierra Club, the TM plan was amended in 1978 to establish revised timber sale levels for ensuing fiscal years as follows: 1977, 127 MMBF; 1978, 152 MMBF; 1979, 144 MMBF; 1980, 170 MMBF; and 1981, 170 MMBF.

The expansion of Redwood National Park in 1978 reduced private timber inventory by an additional 1.6 billion board feet. This reduction amounted to about 11 percent of the private timber inventory remaining at the time. In passing the Redwood National Park Expansion Act, Congress mandated a study of alternative timber harvest levels for the Six Rivers National Forest to ascertain the feasibility of modifications in the TM Plan. The idea was to help reduce the effects on the local economy caused by the park expansion. The study, subtitled “Federal Options to Mitigate Economic and Social Impacts Resulting from the Expansion of Redwood National Park,” provided eight management alternatives with annual harvest levels ranging from 137 MMBF to 400 MMBF. These alternatives were to be considered in the Forest’s Land and Resource Management Planning Process.

The TM Plan was further amended in October, 1979, to adjust for Roadless Area Review (RARE II) wilderness proposals. This amendment called for an ASQ of 186 MMBF based on a timber suited land base of 429,300 acres. The TM Plan was again amended in May 1985 to reflect the effects of the California Wilderness Act of 1984, which superseded earlier modifications for RARE I and II. The Forest is currently limited to a maximum sell level of 170 MMBF per year by the 1978 Sierra Club agreement, until completion of the Land Management Plan, unless catastrophic events (fire, insects, disease), congressional legislation, Executive Orders, or legal decisions direct otherwise.

Other major legislation and Executive actions related to land allocations and timber harvesting on the Six Rivers include the wild and scenic river additions in 1981, Recovery Plans for bald eagle and

peregrine falcon, the Research Natural Area (RNA) network, the designation of the Smith River NRA in 1990, and the recent Record of Decision for Amendments to the Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (FSEIS ROD).

The average volume of timber sold annually on the Six Rivers National Forest from 1981 through 1990 was 139 MMBF. The Forest sold 10.5 MMBF in 1991, 7.9 MMBF in 1992, and 3.3 MMBF in 1993.

Forest Land Classification: The ability to produce timber from National Forest lands is largely dependent on the quantity and productivity of lands allocated to timber management. The National Forest Management Act of 1976 (NFMA) requires an assessment of National Forest lands to determine those acres which are capable, available, and tentatively suitable for timber production.

Capable lands are those where growth potential is at least 20 cubic feet per acre, per year. Available lands are those which have not been legislatively or administratively withdrawn from timber management. Wildernesses, late seral reserves, and riparian reserves are examples of lands which are unavailable. Tentatively suitable acres are those lands which can be reforested within five years and where timber harvest would not cause irreversible damage to soil productivity or watershed conditions. Actual suitability determinations (identification of geologic hazards, inoperability, regenerability, and other factors) occur as the tentatively suitable lands are ground-checked at the project level.

Lands which are capable, available, and physically suitable are classified as tentatively suitable for timber management. Table III-38 and Figure II-1 display land suitability for timber production. Additional lands may be removed from the timber management land base because resource objectives are not consistent with timber management or management for timber would not be cost efficient. RNAs, Botanical areas, and lands difficult to reforest are included in this category. These lands vary by alternative and are classified as not appropriate for timber management. Figure II-1 displays the lands considered unappropriate for each alternative.

Only lands determined to be capable, available, and suitable are managed for timber outputs and contribute to the calculation of ASQ. Incidental harvesting or salvage is allowed on some lands removed from the timber management land base, but only if harvest operations are needed to meet management goals and non-timber resource objectives for the area. Areas where timber harvest is specifically prohibited include wildernesses, wild river management areas, and research natural areas.

Table III-38.

Land Suitability for Timber Production

| | Acres | Percent of Land Base |
|---|---|---|
| Total Land Base | 958,470 | 100 |
| Forested | 924,310 | 96 |
| Available | 441,840 | 46 |

| | | |
|---|---|---|
| Capable and Available | 338,520 | 35 |
| Capable, Available, and Tentatively Suitable | 269,410 | 28 |

Sawtimber: Sawtimber is the most important commercial commodity produced on the Forest. The Forest, as directed by federal law, sells timber to help satisfy local, regional, and national demands for lumber and other wood products. Six Rivers is one of the major timber producing Forests in California. According to timber inventories completed in 1980, the Forest has approximately 12 billion board feet of standing timber on lands classified as tentatively suitable for timber production. The primary species harvested is Douglas-fir. In addition, appreciable amounts of white fir, red fir, ponderosa pine, sugar pine, and incense cedar are sold, as well as minor amounts of redwood, Port-Orford-cedar, Jeffrey pine, lodgepole pine, and black oak.

Nearly all of the timber provided by the Forest is processed in the local communities of southwestern Oregon and northwestern California. The Forest provides a relatively large proportion of the volume to some of the local mills, which leads to highly competitive bidding on most sales. In recent years nearly all of the timber offered for sale on the Forest has been sold. Sales typically sell for rates substantially higher than the advertised rates. Timber sale receipts normally exceed the cost of preparing and administering sales, regenerating the timber, and building timber haul roads. Individual timber sales have been sold below cost; however, it is a rare occurrence.

Timber prices on the Forest have steadily increased from below $50 per thousand board feet (mbf) in the early 1970s to over $350 per mbf in fiscal year 1992. These long term price trends reflect the increasing scarcity of timber supply in relation to demand.

Demand for the major conifer species on the Forest is reflected in their relative selling values. Sugar pine and ponderosa pine are high value species; Douglas-fir and incense cedar are moderate value species; and the true firs, red and white firs, are lower value species. Port-Orford-cedar is one of the few species removed from National Forest land which can be exported in unprocessed (log) form (36 CFR 223.193; see discussion in Trees with Special Management Consideration section of this chapter). The demand for this species in other countries, particularly Japan, has resulted in extremely high selling values in recent years.

The Forest has been cutting small amounts of redwood since the 1960s as a normal part of the timber sale program. Most of the redwoods on the Forest are located in the Smith River corridor and along Highway 101, near the town of Klamath. On November 16, 1990, Senate Bill 2566 was signed into law creating the Smith River National Recreation Area. Consequently, the majority of the redwoods that exist on the Forest will be managed to meet recreation objectives rather than as a source of redwood lumber and wood products.

The current and future demand for Six Rivers National Forest timber is closely tied to the private timber supply situation in the local area. A reduction in private timber harvest appears to be inevitable; output from public lands has also been declining. Lower timber harvest from private

timber lands is mainly due to a reduction in current inventory and land base, changes in land management policies, and changes in the State forest practices regulations. Lower harvest levels on the Forest are mostly due to recent actions such as the legislation of the Smith River National Recreation Area and the adoption of the FSEIS ROD. These actions have greatly reduced the Forest land base available for timber harvest.

Hardwoods: Hardwoods are a primary component of two vegetation types on the Forest, the white oak/black oak type and the Douglas-fir/tanoak/madrone type. The white oak/black oak type comprises approximately 26,000 acres. Conifers such as Douglas-fir and ponderosa pine can occur within this type but are a minor component. Some white oak/black oak stands are actually a successional stage to a Douglas-fir type; that is, as the oaks mature, Douglas-fir seedlings regenerate naturally in the understory and grow to eventually replace the hardwoods. The conifers may dominate the site for some time until they are removed by a catastrophic disturbance or timber harvest.

The Douglas-fir/tanoak/madrone type is the most prevalent on the Forest, comprising some 450,000 acres. The proportion of hardwoods to conifers within this type is largely dependent on the successional stage, fire history, logging and reforestation history, and site conditions such as aspect and water holding capacity of the soil. Fire suppression has altered successional patterns in this type, and many stands are subsequently developing toward a hardwood climax vegetation.

Accurate estimates of the amount of hardwoods on the Forest do not exist.

Fuelwood: The Forest provides a supply of firewood for home heating. The demand for firewood has risen dramatically over the last decade. Madrone, tanoak, black oak, chinquapin, and Douglas-fir are the most frequently utilized species. Fuelwood is provided to the public in several ways:

Personal-use firewood: Permits are sold to individuals to gather fuelwood for personal use. Over the past several years the Forest has issued permits for an average of about 2,500 cords annually. Personal-use gathering typically involves use of a pick-up truck and possibly a cable and winch. Because much of the Forest is inaccessible to this type of equipment, and because some Ranger Districts allow cutting of dead and down trees only, most personal-use gathering occurs within recently logged areas. Use is focused on roadside areas, areas with gentle slopes, and on landings where decks of hardwood or non-merchantable conifer logs were left after logging. Use is typically heaviest in areas with the best road access and closest to population centers. With the decrease in harvesting that has occurred over the past several years, the demand for personal-use fuelwood has exceeded the supply available in these areas, forcing individuals to drive farther for sources of fuelwood.

Commercial fuelwood sales: Commercial fuelwood purchasers operate on sites requiring ground skidding or cable yarding systems, and on sites which are too far from population centers to be attractive to most personal-use fuelwood permittees. Commercial sales include green tree harvesting as well as removal of logging slash and landing decks. Economic practicality of commercial fuelwoods is highly sensitive to haul distances and yarding method. Typically these sales have not been highly profitable.

Hardwoods included within commercial timber sales: The majority of hardwood removed by timber sale purchasers is utilized for the production of paper pulp and electric power generation. Some of the larger, straighter logs are manufactured into lumber. A very small percentage of the hardwood removed by commercial timber sale purchasers is utilized as fuelwood.

Other Forest Products: The Forest offers a variety of forest products either by permit or commercial sale. Conifer logs which are not suitable for sawtimber production are converted into wood chips, which are used to manufacture paper products. Hardwoods, particularly tanoak, are likewise converted into chips. Other products include madrone and maple burls, cones and hardwood seed, boughs, Christmas trees, posts and poles. Mushrooms and various ornamental and medicinal plants are also forest products; they are discussed in the Special Forest Products Management section of this chapter.

Harvest Methods: Logging is accomplished by a wide variety of methods. Harvest methods are categorized by the system used to move logs to a transport site (landing). They can be broken into three broad categories: ground skidding, cable yarding, and aerial yarding. Each method has different advantages, limitations, and costs.

Ground skidding is performed by tractors or wheeled skidders. These machines are comparatively inexpensive to operate and are well suited to situations where only a portion of the stand is being removed, such as intermediate harvest. However, skidding is limited to dry soil conditions and relatively gentle slopes. Because of slope limitations, ground skidding is appropriate on only a small fraction of the Forest's tentatively suitable land base. This method has the highest potential for soil compaction and displacement.

Cable yarding moves logs to a road or landing by a system of cables. Logs may be pulled on the ground, pulled with one end suspended above the ground, or "flown" completely suspended above the soil depending on the topography and system configuration. The ability to achieve one end suspension or full suspension of logs depends on a number of factors including the size and capability of yarding equipment, topography, yarding distance, and the size of the logs. Intermediate harvesting may or may not be feasible with cable systems depending upon these factors. Cable systems are generally somewhat more expensive than ground based skidding but can be used on steep slopes and often under wet soil conditions.

The use of helicopters for aerial yarding has been rare on the Forest but is increasing. This trend is expected to continue as helicopters are used to harvest otherwise inaccessible areas or to mitigate specific resource concerns related to conventional yarding systems. Helicopters are capable of intermediate harvesting with virtually no ground disturbance. Furthermore, helicopter yarding is not sensitive to topography and requires less road and landing construction than ground skidding or cable yarding methods. The primary disadvantages of helicopter yarding are high costs and lack of road access development. In some situations the cost of helicopter yarding may be higher than the timber value; this is especially true in the case of small logs, low value species, and light intermediate harvesting. Also, if roads are not constructed to provide access to harvested areas, the costs and difficulties of regeneration and timber stand improvement treatments and other resource monitoring may be greatly increased.

Silvicultural Systems: Silvicultural practices, including stand regeneration, thinning, regeneration harvesting, and prescribed burning, are used to influence vegetation development. Appendix K contains a more in-depth discussion of silvicultural principles. Forest stands on the Six Rivers are managed by one of two silvicultural systems: even-aged or uneven-aged. Descriptions and applications of these systems are in Appendix K.

Past management objectives, experience, and research have supported the use of even-aged systems as the primary silvicultural system for the Forest. This is primarily due to: 1) the silvics of the predominant conifer species on the Forest and the need to provide microenvironmental conditions conducive to seedling survival, 2) logging system and fuel hazard reduction limitations imposed by steep, rugged topography, and 3) the existing disturbance (fire) regime on the Forest which has resulted in a vegetation pattern predominantly comprised of even-aged stands. The 1971 Timber Management Plan selected even-aged management as the preferred method for the Plan period (1971 to present). Up until recently, clearcutting has been the primary method used to regenerate stands under this Plan. The shelterwood method has also been used. Intermediate harvesting has occurred, primarily in the form of thinnings and salvage cutting.

Some uneven-aged management has occurred on the Forest in areas with other specific resource objectives, such as maintenance of a continuous forest cover. In the Douglas-fir/tanoak/madrone forest type, the abundance of sprouting hardwoods makes regeneration extremely difficult under an uneven-aged management scheme. In general, in comparison to even-age management, uneven-age management requires more frequent stand entry and a somewhat higher road density. On slopes over 40 percent, which includes the majority of the Forest, it is difficult to achieve uneven-age management objectives using cable yarding methods. Helicopter or balloon yarding methods are prohibitively expensive in most situations.

In order to regenerate stands, it is necessary to provide a seedling environment with sunlight, soil moisture, and nutrient levels adequate for the desired tree species. The objective of regeneration harvesting and site preparation is to provide these requirements. The optimum environment for establishing shade-intolerant species such as Douglas-fir and ponderosa pine on the Forest is full or nearly full sunlight.

Traditional even-age systems have been modified in the last few years to provide increased diversity in forest stands. Harvest units are located to minimize habitat fragmentation, and silvicultural prescriptions are designed to provide increased wildlife habitat and soil protection. Regeneration with legacy is a method which, throughout the rotation, retains various levels of large live conifers and hardwoods, snags, large logs, and, where present, patches of understory conifer seedlings and saplings. Low levels of legacy retention provide important habitat niches for various wildlife species, but may have visual characteristics similar to a clearcut. Where high levels of legacy structures are retained, the visual effects of harvesting are much more subdued. Not only are habitat niches provided, but moderate and high levels of legacy trees contribute toward development of a multi-story stand structure considered important to some species associated with late successional forests.

Research findings are continuing to improve understanding of the complexity of forest ecosystems. Increasing evidence indicates that practices which intensively exploit timber resources and reduce species and landscape diversity may not provide for ecosystem function over the long term.

Traditional practices, in particular, may not maintain soil productivity or provide the habitat requirements for all native wildlife species. It is believed that timber management practices that maintain a diversity of species, age classes and stand structures can maintain healthy, resilient forest ecosystems and provide a sustainable level of forest outputs. Historically, the emphasis of National Forest timber management has been directed to activities that optimize tree growth for timber production purposes. Under concepts newly adopted by the Forest Service, the emphasis is being redirected to maintaining the health of the ecosystem and all its component parts. Although the historic role of optimizing tree growth is not being abandoned, ecosystem health now takes precedence in establishing the level of values and uses to be provided by the National Forests. These concepts recognize the dynamic nature of forest succession and the need for management flexibility on a broad geographic scale to sustain the health, values, and uses of forest ecosystems.

Reforestation: National Forest Management Act (NFMA) regulations specify that trees can only be harvested from lands that can be adequately reforested within five years after harvest. This standard applies to both even-aged and uneven-aged silvicultural systems.

Reforestation is achieved by either natural or artificial methods. Due primarily to the unreliability of seed crops, past experience with natural regeneration in shelterwood and selection cuttings commonly resulted in failure. This is particularly true in the Douglas-fir/tanoak/madrone type. Typically, shade tolerant hardwood species grow to occupy the sites, while few or none of the desired conifers such as Douglas-fir and ponderosa pine become established. Therefore, to assure adequate and prompt reforestation, artificial regeneration by planting is the most commonly used method on the Forest. Artificial regeneration has been used primarily in areas harvested by clearcutting and shelterwood cutting and in areas burned by catastrophic wildfires. A total of about 115,000 acres of plantations have been created on the Forest by artificial regeneration. Many of these plantations are less than 20 to 25 years of age. Between 1981 and 1990, an average of 2,950 acres were regenerated annually by planting.

Douglas-fir, ponderosa pine, and Jeffrey pine are the most common species planted on the Forest. Small amounts of rust-resistant sugar pine are also planted. Natural regeneration is most often used to establish shade tolerant species, such as red fir, white fir, and incense-cedar.

Depending on the species and site conditions, typically 400 to 600 seedlings are planted on each acre. The recommended stocking standards are between 200 to 250 trees per acre. This “overplanting” allows for some seedling mortality in the early years of the new stand and removal of inferior trees during precommercial thinning in 10 to 15 years. This leaves the “superior performers” in the stand. Seedling losses can be due to poor planting stock, improper planting procedures, animal damage, plant moisture stress, and competition from other vegetation.

The seedling survival rate after one growing season has consistently been about 70 percent for Douglas-fir and 80 percent for the pines. The success of planted seedlings, along with the natural regeneration that occurs, has resulted in a high percentage of the Forest’s plantations meeting reforestation standards within five years after harvest.

Release and Precommercial Thinning: Plantation management includes suppressing vegetation which is competing with desired seedlings for light, moisture, and nutrients, and thinning dense stands of older seedlings and saplings to provide adequate growing space for selected trees. These

treatments can reduce the susceptibility of stands to insects and disease, and can greatly improve the survival and growth of desired trees. They can also be used to accelerate stand development toward desired structural characteristics, such as a particular type of wildlife habitat.

Release and thinning treatments can be accomplished by manual, mechanical, or chemical methods. The treatment method selected for any given site depends primarily on site conditions and costs. Other factors, such as other resource concerns and public opinion, also play a part in the selection of a treatment method.

Precommercially thinned and/or released averaged about 2,000 plantation acres per year between 1986 and 1990. Current inventories indicate that 20,000 acres need release and 3,500 acres need precommercial thinning.

Release of plantations on the Forest was primarily accomplished by the application of herbicides until 1984. A moratorium was imposed on the use of herbicides in 1984, until an Environmental Impact Statement and risk assessment could be completed. Release treatments have been done by manual or mechanical methods since 1984.

The Regional Forester issued a decision on the Final Environmental Impact Statement (FEIS), Vegetation Management for Reforestation on February 27, 1989. The selected alternative allows for the full range of methods for controlling competing vegetation to be considered, including the use of herbicides.

Many of the species which compete with desirable young trees are vigorous sprouters and rapid growers initially. Experience and studies indicate that non-chemical release methods are often ineffective and/or too costly in terms of meeting management objectives. The analysis done as part of the Regional FEIS on Vegetation Management for Reforestation indicates that a ban on herbicide use could result in reduced timber yields and increased costs.

Opportunities

The Knutson-Vandenberg Act of June, 1930, provides for funds to be collected from timber sale receipts to finance sale area improvement projects such as slope stabilization, wildlife and fisheries habitat improvement, and recreation development. Continued use of Knutson-Vandenberg (KV) funds generated from timber sale receipts could finance sale area improvement projects including reforestation, stand protection and improvement, slope stabilization, wildlife and fisheries habitat improvement, and recreation development.

Opportunities exist to manage the forest to produce timber and forest products and provide for other resources including wildlife. Silvicultural activities can help accelerate the development of desirable structural components, and maintain or enhance species diversity within stands and across broader landscape areas. Thinning stands can increase conifer growth, encourage understory development, and increase plant diversity. Regeneration practices which leave live trees, dead standing trees, and down logs may help to maintain or increase biological diversity. Harvest units can be located to provide future contiguous habitat for wildlife and decrease fragmentation.

Timber harvest can also be used as a tool to reintroduce both large and small disturbance regimes back into the ecosystem. Regeneration harvesting can help create a balance of desirable seral stages and restore conifer species in stands where conifers are gradually being lost to hardwood species. Use of group selection, thinning, and single tree selection harvest systems could create canopy gaps, encourage regeneration, and accelerate the development of more diverse forest stands. Accumulation of biomass from fire exclusion can be reduced through harvest operations, reducing fire hazard, and increasing stand vigor and health.

The relationship between disturbance, including timber harvest, and other biological, physical, and social aspects of the ecosystem are not fully understood. Timber management practices need to be monitored and evaluated in the upcoming years, and adjustments made as new information becomes available.

Affected Environment in Context of Alternatives

The potential effects of the various management alternatives on the timber related issues are discussed further in Chapter 4.

## TREES WITH SPECIAL MANAGEMENT CONSIDERATION

### Public Issues

Issue 32 How will the Forest protect redwood trees?

Issue 33 What plan does the Forest have to ensure the maintenance of Pacific yew?

Issue 34 Has the Forest developed a plan to control Phytophthora lateralis and to maintain Port-Orford-cedar?

### Current Situation

Several tree species found in small groups, or as individuals, are of concern to the public and Forest managers. Special consideration has been given to the maintenance of these species.

1. Redwood (Sequoia sempervirens): Small areas with redwood are found on the northwest part of the Forest in the Smith River National Recreation Area and within the Yurok Redwood Experimental Forest. There are approximately 2,600 acres where redwood is a component of the stand. All groves of redwood are protected from harvest on the Forest.

2. Pacific yew (Taxus brevifolia): On this Forest, Pacific yew is near the southern extent of its range (Scher and Jimerson, 1989). This coniferous tree is typically found in lower one-third slope positions along streams in association with Port-Orford-cedar, Douglas-fir, and white fir. It can grow well up to the ridge top in many places. Pacific yew is shade tolerant. It is usually found in undisturbed late seral stage stands in shrub form; occasionally (<10 percent), it can be found as an understory tree (Jimerson & Scher, 1993). It is quite resilient and continues to survive and grow after wounding from deer and elk antler rubbing, heavy browsing, fire, and after being pushed over

by the falling of larger trees. Many yew are found in tree form in young forests as well as older forests. Though it prefers shade, it also survives and grows after full exposure to sunlight. Pacific yew grows slowly. It has many special uses and is important culturally to Native Americans for use in bows and other products.

Research has shown promise for the chemical taxol, which is found in the bark of the Pacific yew, as well as other species of yew, as a treatment for ovarian and other forms of cancer. Between 1991 and 1993 there was high demand for the bark of the yew. During that time the National Cancer Institute (NCI) and Bristol-Meyers Squibb Company (BMS) had a Cooperative Research and Development Agreement (CRADA) for the development of taxol to expedite clinical research. The Secretaries of Agriculture, Interior, and Health and Human Services signed a Memorandum of Understanding (MOU) to ensure that quantities of taxol were available for continued research. The MOU recognized the need to coordinate the activities of their respective agencies to advance the goals identified in the MOU. The Forest Service and BLM met NCI's bark requirements of 750,000 pounds per year. After two years of the 5-year period of the CRADA (1991 to 1995), alternative sources of taxol or precursor chemicals to taxol were sufficiently developed to allow BMS to cease the collection of yew bark in the forest.

An environmental impact statement for the management of Pacific yew was completed for the Forest Service by an interdisciplinary team located in Portland, Oregon. It was completed in early 1993 after bark collection had ended.

Pacific yew trees on the Six Rivers are typically under six inches in diameter at breast height. Bark collections were almost exclusively in Oregon, Washington, and Idaho due to the larger size boles and greater availability. There were no commercial collections of yew bark on the Six Rivers National Forest during the period 1991-1993.

3. Port-Orford-cedar (Chamaecyparis lawsoniana): This valuable conifer grows in the lower one-third slope position along streams and in wet areas in a wide variety of plant associations (Jimerson & Creasy, 1990). It is present and growing well across the landscape on the Smith River NRA and in some areas on the Orleans and Lower Trinity Ranger Districts. Since the introduction of Port-Orford-cedar root disease (Phytophthora lateralis), managing for the future of this important tree will not only depend on appropriate application of silvicultural and harvesting practices that reduce the spread of the fungus that causes the disease, but also require the education and assistance of the forest recreationist, hunter, OHV enthusiast, and forest users in general. See the section on "Pests" for more information on Port-Orford-cedar root disease fungus.

Port-Orford-cedar is a species which may be legally exported in raw log form from the national forests where it grows (Japan is the chief importer). Based on a provision in the Forest Resources Conservation and Shortage Relief Act of 1990 that allows exceptions (as identified by the Secretary of Agriculture) to the general prohibition against such exports, Port-Orford-cedar has been determined to be surplus to the needs of the domestic lumber industry and so may be cut and exported as logs as well as lumber (interim guidelines in 36 CFR 223.193). This species commands very high prices on the international market, in some cases over $10,000 per thousand board feet on the stump.

Since the spread of the disease is primarily connected to the activities of humans during wet periods, the forest has been assessing, and will continue to assess the need for seasonal or permanent road or trail closures in areas where such closures would help to reduce or prevent the spread of the disease.

### Opportunities

Opportunities for study of redwood on the Forest are limited. Studies within the Yurok Experimental Forest are under the direction of the Pacific Southwest Forest and Range Experiment Station, Redwood Sciences Lab. Studies undertaken by the lab are wildlife and watershed related.

Specific management strategies for Port-Orford-cedar are displayed in the Forest Plan Standards and Guidelines. The Forest will also use strategies developed through practice, experience, and the Region Five/Region Six Port-Orford-cedar Root Disease Action Plan of July, 1988, which was developed by a group that included industry, agency, environmental, and university personnel and citizens. The effectiveness of these measures is being monitored.

An ecological classification of Port-Orford-cedar stands in northwest California (Jimerson and Creasy, 1990) has been completed. It could be used to reestablish Port-Orford-cedar in plant associations altered by root disease.

### Affected Environment in Context with Alternatives

Management strategies for Pacific yew, redwood, and Port-Orford-cedar are the same for each alternative. Since Pacific yew was found infected with Phytophthora lateralis where the tree is involved with Port-Orford-cedar under ideal conditions for the fungus, the analysis and control strategies used for Port-Orford-cedar will be implemented when management activities are in or around Pacific yew. In light of this and the protective measures to be outlined in the management plans for each species, the effects of all alternatives on these issues would be similar. Port-Orford-cedar is discussed further in the Pest section. All redwood stands on the Forest are protected under the Smith River NRA legislation. Management activities would be analyzed in project- or program-specific NEPA documents for their potential effects on redwood, Pacific yew, and Port-Orford-cedar. With the exception of Issue 34, the effects of the management alternatives on these species and the public issues identified above are not discussed further in Chapter 4.

## SPECIAL FOREST PRODUCTS

### Public Issues

Issue 35 How will the Forest ensure the sustainability of special forest products while providing a source of income for local communities?

Issue 36 How will the Forest balance the utilization of special forest products among culturally diverse publics?

### Introduction

Special forest products are defined as non-timber, renewable vegetative natural resources that can be utilized either for personal or commercial use. Special forest products fall into many categories including berries and wild fruit, floral greenery, cones and seeds, mushrooms, and dyeing materials.

Personal collection of plant material from the Forest is both a social and cultural practice. Individuals and families from rural communities, who for generations have maintained strong ties to the land, have relied on forest products for food, medicinals, and other uses. Although less widespread, rural cultures continue to harvest plant material from the Forest. To the Native Americans, collection of plant material is not only a means of obtaining food and medicinals, but the very act of collecting imparts cultural and spiritual significance (Heffner, 1984). Traditionally, Native Americans actively managed the landscape so as to favor the plant materials of importance to their community (for example, burning to enhance acorn yield and maintenance of oak woodlands) (Blackburn, 1993).

Rural communities, in concert with the shift in emphasis from timber-based economies, are relying more heavily on a broader range of forest products. The demand for special forest products has grown considerably in the last few years as markets for products have been discovered both nationally and internationally (Thomas, 1993). Edible mushrooms, floral greens, and Christmas ornamentals constitute the major market to date (FSEIS, 1994). The true economic value of these products is not accurately known due to below-market pricing by the public agencies and poor tracking of special forest products removed from the Forest (Forest Ecosystem Management Assessment Team, 1993).

Current Situation

The Forest is authorized to sell special forest products “where it will serve local needs and meet land management objectives” (FSM 2467). Commercial collection of special forest products is administered by issuing a Forest Products Sale Permit for low value sales; sales over $10,000 require more lengthy specifications and use of a Timber Sale Contract form (FSH 2409.18). No permits are required for personal collection.

Given the traditional emphasis on timber as the primary commodity extracted from the Forest and the lack of market development for special forest products (SFP), administration and management of the SFP program is not well developed. The Forest has not been able to keep up with the rate of demand. Additionally, as more interest develops in these products, the potential for social conflict rises as more people with different values (cultural, economic) demand similar products (McRae, 1993). In most cases, little is known about the impact of harvesting on plant species. Given their complicated reproductive history and sensitivity to micro-habitat variation, edible mushrooms are receiving most of the attention from research and studies relative to other groups of species.

Opportunities

Special forest products management is a very complex issue. Sound management warrants consideration of biological, social, cultural, and economic factors. At the center of the SFP issue is the need to manage sustainably. The FSEIS (1994) articulates the need to protect other resource values, special status plants and animals, and resource sustainability.

Research, monitoring, education, real market value pricing, public participation, coordination across jurisdictional borders, database development for tracking key components of SFP management, special forest products habitat enhancement projects, and rural assistance in developing the infrastructure and markets to support a special forest products economy are all opportunities that will be explored during this planning period.

Affected Environment in Context with Alternatives

Management strategies for special forest products are the same for each alternative. Management activities would be analyzed in project-specific NEPA documents for their potential effects on special forest products. The effects of the management alternatives on these species and the public issues identified above are not discussed further in Chapter 4.

## PEST MANAGEMENT

### Public Issues

Issue 34 Has the Forest developed a plan to control Phytophthora lateralis and to maintain Port-Orford-cedar?

Issue 37 Under what conditions should pesticides (herbicides) be used as a Forest management tool?

### Introduction

The only public issue raised dealing with forest pests concerned the development of a plan to control Phytophthora lateralis, cause of Port-Orford-cedar root disease, and the maintenance of Port-Orford-cedar. A related issue addressed the use of herbicides and is discussed under Timber Management.

There are a number of forest organisms which, at times, interfere with timber growth and yield. These organisms are considered forest pests. Native organisms that may function as pests are natural elements of the forest and range ecosystem and have evolved with their habitat. Non-native organisms have the potential to cause large changes in ecosystems because native vegetation may have little resistance, and natural biological controls are usually lacking.

When pests affect trees, a variety of other resources can be affected. The loss of timber through mortality and slower growth is obvious. Pests can adversely affect wildlife by altering their habitat and prey habitat. Large numbers of dead trees on a hillside may alter the visual landscape. The effect of pest organisms may or may not conflict with management objectives for any given resource. For example, the loss of trees and the shade they provide in a campground may make the campground less desirable for summer camping.

Serious damage usually occurs as a result of a pest complex, rather than the action of a single causal agent. Pest complexes often involve, in addition to the pest organisms, the condition of the vegetation (for example: age, stocking density, species composition), environmental factors (for example: drought, heavy storms, flooding), and the effects of management activity.

Current Situation

The primary groups of forest pests likely to interfere with some management objectives are: competing vegetation, diseases, insects, and vertebrates.

A wide range of vegetation competes with conifer seedlings and young trees for moisture, nutrients, light, and space. Excessive competition will affect reforestation success. Some of the competing vegetation on the Forest includes snowbrush, tanoak, chinquapin, and manzanita.

Dwarf mistletoes, Arceuthobium spp., are a widespread group of parasitic plants that attack most of the conifer species on the Forest. They reduce the vigor of their host, resulting in reduced growth and increased mortality risk. Because of Dwarf mistletoes' spore method of spread, it can be particularly damaging in stands that are comprised of predominantly one tree species, often falling from the overstory onto the understory. Reducing the spread of mistletoe can be accomplished through silvicultural treatments which remove mistletoe from infested trees and avoid the establishment of mistletoe in the understory. Stand regeneration, including clearcutting, is commonly the preferred silvicultural treatment for stands comprised primarily of one species which are heavily infected with mistletoe. It is best to avoid the establishment of mistletoe and the creation of situations where it can increase.

White pine blister rust, caused by Cronartium ribicola, is a disease of sugar pine and other five-needled pines. It can kill small trees before they reach commercial size or reproduce. It can also result in the top-kill of larger trees and increase their susceptibility to successful bark beetle attack. The Forest has an active program to screen and locate resistant individuals. As of 1991, there were three resistant sugar pines identified on the Forest. Once a resistant tree is identified, seed can be collected and propagated. Other treatments, such as pruning, may be used in certain situations.

Annosum root disease, a fungus infection that decays tree roots, causes concern not only in the general forest but in developed recreation areas where root-decayed trees could fall. All species of conifers are susceptible to the disease, but white and red fir are especially prone to root decay. Disease centers are initiated when a spore of the fungus Heterobasidion annosum infects the stump of a freshly cut conifer. Once established in the stump, the fungus grows through the root system and often infects live trees through root contact. Centers may persist for decades and eventually occupy up to one tenth acre or more. Treating stumps can prevent spore infection.

Black stain root disease, Leptographium wageneri, causes mortality to Douglas-fir. This disease appears to occur in areas that have undergone site disturbance. Sapling and pole-size trees appear to be the most affected on this Forest. In areas where this disease is known to be prevalent, management activities that minimize site disturbance should be practiced to reduce the occurrence and impact of the disease.

Port-Orford-cedar root disease, caused by Phytophthora lateralis, is a non-native disease first observed in natural stands of Port-Orford-cedar in southwestern Oregon during the 1950s (Zobel et al., 1985). The disease is present in parts of the Smith River drainage in the Smith River NRA. The Klamath and Trinity river drainages to the south remain uninfected. Figures III-47 and III-48 show the presence of Port-Orford-cedar and the distribution of Phytophthora lateralis on the Forest. The

fungus is soil-borne and spreads by water or soil movement. All ages and sizes of Port-Orford-cedar are susceptible to the disease. Management strategies for the Forest focus on preventing introduction of the fungus into uninfested areas, limiting movement in infected areas, and growing Port-Orford-cedar on low-risk sites. There is an ongoing program to identify genetic resistance. These strategies were formulated through practice, experience, and in the Port-Orford-cedar Action Plan, approved in June, 1988, by the Regional Forester.

Seedling mortality at Humboldt Nursery can be caused by pests. The most prevalent diseases are; Phomopsis tip blight of Douglas-fir, true firs and western hemlock; Phoma needle blight of Douglas-fir and true firs; Sirococcus tip blight of ponderosa and Jeffrey pines; and Botrytis canker on all species. Controls include annual fumigation, fungicide application, rogueing, and pruning. Gopher damage is controlled by trapping around the perimeters of the fields. Crows that eat sugar pine are discouraged by covering the seedbeds with lath frames and netting. Browsing deer are a minor, but tolerable, problem.

The gypsy moth is a non-native insect which has not permanently established itself in California. It has been eradicated several times from California, and there have been infestations in the nearby states of Oregon, Idaho, and Utah. Spread of the moth has been tied to the transport of egg masses or pupae on vehicles and belongings transported from infected areas to non-infected areas. The use of the Forest by recreationists presents numerous opportunities for an introduction. Feeding by the gypsy moth causes defoliation, and in some cases mortality, of a wide variety of host trees and shrubs. Most resources would be impacted by an infestation. Early detection by pheromone trapping makes it possible to attempt eradication when the infestation is still small enough for treatment to be effective. They are usually treated and eradicated with Bacillus thuringiensis.

Stocking levels are a contributing factor to annual conifer mortality on the Forest. Increased stocking may be a result of management practices, fire exclusion, and shifts in climate. When the stress from heavy stocking is combined with additional stress, such as the drought periods of 1975-77 and recent years, the amount of annual mortality can increase substantially. In areas where it is consistent with other management objectives, thinning stands to lower levels of density can result in lower mortality and improved tree vigor.

Animals also constitute a major group of damaging pests. Black-tailed deer cause significant damage to plantations by browsing seedlings, thereby slowing tree height growth. To protect trees from deer, plastic tubing is installed on individual trees in newly planted plantations. Wood rats strip the bark from the crowns of young conifers, resulting in top-killing. Rabbits cause damage similar to deer by clipping the tops of young seedlings. Gophers clip the tops of young seedlings and strip bark from young conifers. Black bears damage pole-size Douglas-fir and redwood by stripping bark and feeding on inner tissues. However, the amount of bear damage is insignificant.

Opportunities

The Forest Service implements an integrated pest management (IPM) approach when dealing with forest pests. This process has been broken down into a series of steps which ideally function as a continuum. These steps are:

Prevention is a key element of IPM. This involves avoiding the impact of pests before they occur. Prevention can include regulatory measures, cultural measures, and the use of genetically resistant stock.

Detection, or the early discovery of potential pests, is critical to successfully preventing damage. The effects of many pest organisms can be reduced quickly and easily if detected in their early stages. More options are often available for reducing their damage when discoveries are made early.

Evaluation involves gathering and interpreting information about the pest situation to develop alternatives to meet management objectives. This includes biological, environmental, and economic information.

Suppression activities are those directed at the reduction of pest-related damage to acceptable levels. The techniques to achieve this can include, either singularly or in combination, silvicultural, mechanical, chemical, and biological methods. A full range of methods, as well as "no action," are considered for each situation. The preferred course of action is selected on the basis of the ability to attain management objectives, biological effectiveness, cost efficiency, and human health and environmental safety. The activities and techniques used are tailored to the specific situation, including pest, host, and management objectives.

Monitoring has two phases in IPM. First is the need to determine if any suppression activity met the objective. In the broader context, monitoring also needs to be done to determine if the IPM process is adequate and if management objectives are being met.

Forest pest management goals are directed toward reducing pest-related losses to levels that maintain a healthy forest environment. Preventive measures can be included in management prescriptions. Climatic conditions favorable to pest outbreaks will likely occur in the future.

Several non-native organisms would have a high potential to disrupt management if they were to become established. Established methods to exclude these organisms can be incorporated into plans for activities, or areas, which pose a high risk of introduction.

### Affected Environment in Context with Alternatives

The potential effects of Forest management direction relating to the use of pesticides and herbicides are essentially the same for all management alternatives and are not discussed further in Chapter 4. The potential effects of specific projects in relation to the use of pesticides and herbicides will be considered during the project-level NEPA process.

The potential effects of Forest management direction on Port-Orford-cedar are discussed further in Chapter 4.

## VISUAL RESOURCE MANAGEMENT

### Public Issues

Issue 38 How much of the forest scenery is to undisturbed?

Introduction

The appearance of the forest setting is directly related to the amount of timber harvest, location of harvest, and the silvicultural system used. In general, higher levels of timber harvest, combined with even-aged management systems such as clearcutting, would continue to reduce the amount of undisturbed appearing scenery over time.

The Smith River National Recreation Area Management Plan, which is incorporated in its entirety into the Forest Plan provides management direction for the NRA. This management direction is intended to provide scenic qualities that retain an undisturbed or near undisturbed appearance. For purposes of this analysis, the land within the SRNRA has, therefore, been excluded from further discussion. Acres shown in the following charts do not include the 305,000 acres within the NRA.

Current Situation

The Forest has a diverse landscape with many areas of high scenic quality such as rivers, steep river canyons, and forested peaks. The forest consists of two generally different appearing landscapes: landscapes of the northern portion of the Forest are categorized as the Klamath Mountain Region, while the southern portion is categorized as the Coast Range Region.

Landscapes of the northern portion of the Forest contain very steep slopes and sharp ridges. The landforms are highly dissected and broken by drainages that flow to the major river systems and westward to the Pacific Ocean. The water forms vary from small streams and creeks to large rivers. Vegetative patterns are generally uniform and consist of brush and hardwoods in the lower elevations, transitioning to conifers in the higher elevations.

The southern portion of the Forest has gentler, moderately steep slopes with more rounded landforms. The side slopes are only slightly cut by drainages, and topographic forms are lower than those in the northern portion. Grassy glades are common; they tend to diversify the landscape by providing breaks in the forested cover. Forest cover is more varied in the southern portion, and landform changes are less abrupt.

The scenic qualities of the Forest have changed over the last 100 years. The qualities have changed from an undisturbed appearing landscape to one modified by the needs of society in terms of commodity production and resource extraction. To a lesser degree, forest fires and the need to move goods and people through the landscape have altered the appearance. The major change has resulted from timber harvesting and haul roads. Grazing, utility lines, and mining have affected the undisturbed appearance of the Forest to a lesser degree.

In order to define, quantify, and qualify a seemingly abstract-or at least somewhat intangible-resource, such as scenery or visual resources, the Forest Service has adopted the visual management system defined in the USDA Handbook #462, “The Visual Management System.” The system includes the inventory of three elements that represent the natural and social setting. These elements are then combined in a matrix format to result in various Inventoried Visual Quality Objectives (IVQOs). The elements used to derive these IVQOs are:

1. Variety Class: a representation of the diversity of the natural landscape features and appeal of the scenery.

2. Sensitivity Levels: an indication of the public's level of concern for scenic quality; a measure of the relative importance of aesthetics.

3. Distance Zones: a division of the viewed landscape into three areas of visibility categorized as foreground, middleground, and background.

The Forest's "supply" of scenery is inventoried, assessed, and measured by categories of the elements discussed above. Detailed discussion and acreages of such elements follows below.

Variety Class: Variety class is a measure of the inherent scenic quality of the landscape. Those landscapes with the greatest variety or diversity of landform, vegetation, or waterforms have higher scenic value. There are three classes of landscape variety:

1. Class A - Distinctive: these are areas that would likely be photographed by visitors.

2. Class B - Common: these are pleasing but relatively common landscapes; they represent the average image of the Forest.

3. Class C - Minimal: These are landscapes that have little change or variety in landform, vegetation, or waterform. They tend to be boring to many visitors.

The acres and percent of land in each variety class on the Forest are shown in Table III-39.

Table III-39.
Visual Quality
of Six Rivers National Forest lands
by Variety Class

| | Variety Class | | |
|---|---|---|---|
| | A | B | C |
| Acres: | 159,890 | 781,150 | 17,440 |
| Percent: | 17 | 81 | 2 |

Sensitivity levels and distance zones: Sensitivity levels measure concern for scenic quality by the viewing public. They are established for areas viewed from travel routes, recreation sites, and water bodies, communities, or other use areas. It is recognized that all National Forest System land is seen at least by aircraft users; therefore, some degree of viewer sensitivity is established for the entire land base.

Three sensitivity levels are used, each identifying a different level of user concern for scenery: Level 1 (highest), Level 2 (Moderate), Level 3 (Lowest). Travel routes on the Forest have different sensitivity levels; for example, Highway 299 is level 1, Forest Route 1 is level 2, and the numerous

Forest access roads, such as 7N31, are level 3. Viewing distance zones are evaluated from each level 1 and 2 travelway or use area. The acres and percent of land in the Forest viewed from each sensitivity level is shown in Table III-40.

Table III-40.
Visual Quality
of Six Rivers National Forest by
Sensitivity Level

| | Sensitivity Level | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Acres: | 210,870 | 239,620 | 507,990 |
| Percent: | 22 | 25 | 53 |

The Variety Class and Sensitivity Levels established are combined to result in Inventoried Visual Quality Objectives (IVQOs). These can be thought of as defining different levels of visible landscape alterations that would be acceptable. The spectrum ranges from a level that permits only ecological change (Preservation) to that which permits a high degree of visible alteration (Maximum Modification). Refer to the glossary in Appendix G for definitions for each level. These IVQOs are applied to specific land areas according to the inventory of the elements of variety class, sensitivity levels, and distance zones. The distribution of these IVQOs on the Forest represents the existing management strategy for visual resources. Acreages for the IVQOs are shown in Table III-41. Figures III-49 and III-50 contain maps of the IVQOs for the north and south portions of the Forest.

Table III-41.
Inventoried Visual Quality Objectives
by Variety Class in Acres

| Inventoried VQO | Variety Class A | B | C | Total acres | Percent |
|---|---|---|---|---|---|
| Preservation | 130,150 | 15,040 | 240 | 145,430* | 15% |
| Retention | 16,930 | 109,410 | 1,440 | 127,780 | 13% |
| Partial Retention | 10,830 | 157,310 | 1,310 | 169,450 | 18% |
| Modification | 1,970 | 442,500 | 9,630 | 454,100 | 48% |
| Maximum Modification | 0 | 56,900 | 4,820 | 61,720 | 6% |

* Total Acres (Rounded) = Wilderness 123,150; NACUAs and Wild River outside Wilderness 22,280.

The Alternatives define a mix, amount, and location of Visual Quality Objectives (VQOs); those for the selected Alternative would become the Adopted VQOs. The adopted VQOs could vary significantly from the inventoried VQOs depending upon other resource considerations and public issues.

Existing Visual Condition: To determine "what the Forest looks like now" an Existing Visual Condition (EVC) inventory is conducted. This inventory acts as a baseline that represents present Forest condition. The existing visual condition is a measure and classification of the degree of the physical alteration of the landscape. The five categories that are used in this inventory are analogous to the various Visual Quality Objectives. They range from Class I, those, such as wilderness, that are untouched, to Class V, those with major disturbances. The acres of National Forest System land in each category are shown in Table III-42.

Table III-42.
Existing Visual Condition of Six Rivers National Forest by Acres

| Category | Visual Condition | Acres |
|---|---|---|
| I | Untouched-wilderness | 145,430 |
| II | Unnoticed | 127,780 |
| III | Minor Disturbance | 169,450 |
| IV | Disturbed | 454,100 |
| V | Major Disturbance | 61,720 |

Opportunities

It is difficult to specifically quantify the demand for visual resources for a specific area, but the nature of the demand can be inferred from examining related trends and occurrences in and around the affected area. It can be inferred from the following factors that there is a demand for a high degree of scenic quality within the Six Rivers National Forest.

1. The recent congressional legislation that established the Smith River National Recreation Area recognizes the unique scenic qualities of the area and the need to protect such qualities.

2. Four rivers on the Forest have been included in the National Wild and Scenic Rivers System.

3. Highways 199 and 299 are designated National Forest Scenic Byways.

4. The four major Highways that transect the Forest (Highways 36, 96, 199, 299) are included by the State of California in its Master Plan of State Highways Eligible for Official Scenic Highway Designation.

5. The importance of the growth of tourism in California.

There is also growing frustration by the general public about the practice of clearcutting. While this issue has many facets, such as its impact on biological diversity, a very real aspect is that people simply do not like the looks of clearcuts. The demand for a high level of visual quality appears to be steadily growing and is predicted to continue to increase in the future. Failure to address this issue

will continue to produce conflict between public expectations and Forest management practices whenever commodity production results in a visual condition that falls short of expectation.

Affected Environment in Context with Alternatives

The potential effects of the various management alternatives on visual quality are discussed further in Chapter 4.

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# ENVIRONMENTAL CONSEQUENCES

## INTRODUCTION

The purpose of this chapter is to disclose the environmental consequences of implementing the alternatives described in Chapter 2. Each alternative potentially impacts various resource elements within the environment relative to the existing conditions and affected environment described in Chapter 3.

Some issues, as stated in Chapter 1, are discussed only briefly in this chapter. These discussions are found in the section titled, "Activities of No Significant Environmental Effect." The impacts, or effects, for the remaining issues are discussed in detail in this chapter, and form the scientific and analytic basis for the environmental comparison of alternatives presented in Chapter 2.

The description of environmental consequences is grouped by the same resource elements used in the previous chapters. Impacts on each of the elements are discussed in terms of their direct, indirect, and cumulative effect(s). A direct effect is caused by and occurs at the same time and place as a specific action. An indirect effect is caused by the action but is later in time or farther removed in distance from the activity, and would be significant in the foreseeable future. Cumulative effects result from the incremental effects of actions when added to other past, present, or reasonably foreseeable future actions, regardless of what agency, entity, or person undertakes the actions. Cumulative effects can result from individually minor, but collectively major, actions taking place over a period of time.

Potential adverse environmental effects which cannot be avoided are discussed at the end of this chapter. Unavoidable adverse effects result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced or mitigated by limiting the extent or duration of effects.

Short-term uses (effects) are those that occur annually or within the first ten years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services for 50 years and beyond. Short-term uses and long-term productivity are also discussed at the end of Chapter 4.

Irreversible and irretrievable resource commitments are not normally made at the programmatic level of a Forest Plan. Irreversible commitments are decisions affecting non-renewable resources such as soils, minerals, cultural resources, and plant and animal species. Such commitments of resources are considered irreversible when the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or the resource has been destroyed or removed. For instance, the gradual decline in old-growth habitat would be considered an irreversible commitment. While the application of management prescriptions allowing land altering activities can indicate the potential for such commitments, the actual commitment to develop, use, or affect non-renewable resources is made at the project level.

Irretrievable commitments represent opportunities foregone for the period during which resource use or production cannot be realized. These decisions are reversible, but the production opportunities foregone are irretrievable. An example of such commitments is the allocation of management prescriptions that do not allow old-growth timber harvest in areas containing suitable timber lands. For the time over which such allocations are made, the opportunity to produce timber from those areas is foregone, thus irretrievable. Irreversible and irretrievable commitments are discussed in more detail at the end of Chapter 4.

All effects disclosed in this chapter assume complete compliance with the standards and guidelines summarized in Chapter 2. These standards and

guidelines contain many of the mitigation measures that avoid, minimize, reduce, or eliminate probable or potential environmental impacts. Standards and guidelines, in coordination with monitoring and evaluation requirements, serve as the mechanism for reaching desired future conditions. The Monitoring and Evaluation Plan for the preferred alternative comprises Chapter 5 of the Forest Plan.

The following assumption was made for estimating the effects of alternatives at the programmatic Forest Plan level: the kinds of resource management activities allowed under the management prescriptions will occur to the extent necessary to achieve the goals and objectives of each alternative. The actual location, design, and extent of such activities are project level decisions and are not known at this time. Thus, in many cases, the discussions refer to the potential for effects to occur, realizing that these are only estimates. The effects analysis is useful in comparing and evaluating alternatives, but should not be applied directly to any specific location within the Forest.

Maps for each of the alternatives are found in the map packet. These maps show the geographic distribution, by alternative, of management prescriptions and show the differences in emphases between alternatives.

The issue of herbicide use was addressed in a final environmental impact statement for vegetative management and reforestation issued by the Pacific Southwest Region in March, 1989. This statement is hereby incorporated by reference, and no additional discussion of the consequences of herbicide use is presented in this chapter.

The following references for the alternatives are used throughout this chapter.

CUR - Alternative A: Current/RPA

PRF - Alternative B: Preferred

OGR - Alternative C: Old Growth Reserve

MKT - Alternative D: Market

ECR - Alternative E: Ecological Rotation

## ACTIVITIES OF NO SIGNIFICANT ENVIRONMENTAL EFFECT

This section contains brief discussions of environmental consequences not discussed in detail in the section titled “Environmental Effects and Mitigations.” Two conditions were used to determine which resources and related issues would not be discussed in detail: (1) the potential effects of the various management alternatives on a resource are similar for all alternatives and (2) the issues are not used to weigh the relative merits of the various alternatives. Effects on these resources will be addressed through the project-level NEPA process.

The discussions are presented by resource elements in the same order as in previous chapters. Management strategies, where identified for a resource, and their effects are described in Chapter 3.

## PHYSICAL ENVIRONMENT

### Geology

This section relates to the following issue:

Issue 4 Will management activities accelerate geologic instability, and thereby degrade water quality?

Potential effects of Forest management direction on geology and geologic instability are essentially the same for all alternatives. Effects of this issue are not used to weigh the relative merits of the alternatives. Issues relating to water quality, streamside management, and special interest areas are discussed in relation to the respective resource later in this chapter.

## BIOLOGICAL ENVIRONMENT

### Genetics

Genetics was not identified as a public issue, but was discussed as the relationship of maintaining genetic variability to biological diversity. The potential effects of Forest management direction on genetics are the same for all alternatives and are not used to weigh the relative merits of the alternatives.

### Sensitive Plant Species

This section relates to the following issue:

Issue 9 How will sensitive plant populations be managed?

Management strategies for sensitive plant populations do not vary by alternative and are expected to minimize the impacts on the various species. Effects related to this issue are not used to weigh the relative merits of the alternatives.

## RESOURCE MANAGEMENT PROGRAMS

### Research Natural Areas

This section relates to the following issue:

Issue 14 What areas will be recommended for establishment as Research Natural Areas?

Size and management direction for Research Natural Areas (RNAs) do not vary by alternative, and effects related to the RNAs are expected to be the same for all alternatives. Effects related to this issue are not used to weigh the relative merits of the alternatives.

### Special Interest Areas

This section relates to the following issue:

Issue 15 How will Special Interest Areas be protected?

Size and management emphases of the three of the four botanical areas within the Smith River National Recreation Area and the Bluff Creek Geologic Interest Area are the same for all alternatives. Effects related to this issue are not used to weigh the relative merits of the alternatives.

Effects related to the Noth Fork, Lassics, and Horse Mountain Botanical Areas are discussed in the "Environmental Effects and Mitigations" section of this chapter.

### Humboldt Nursery

No public issues were identified relative to the Humboldt Nursery. The potential effects of the various management alternatives on the Nursery are essentially the same and are not used to weigh the relative merits of the alternatives.

### Law Enforcement

This section relates to the following issue:

Issue 16 How will the Forest reduce the hazard to forest users created by the illegal use of Forest land for marijuana cultivation?

The effects of Forest management direction on the potential for illegal use of National Forest System land and law enforcement are essentially the same for all alternatives. Effects related to this issue are not used to weigh the relative merits of the alternatives.

### Transportation and Facilities

This section relates to the following issues:

Issue 18 Has the Forest considered stopping new road construction and/or obliterating existing roads?

Issue 19 Has the Forest designated existing and future utility corridors?

Issue 18 is addressed in the Transportation and Facilities Management section later in this chapter.

Primary electric transmission lines across the Forest serve the population centers of Humboldt and Del Norte counties as final destinations. These lines are in three corridors identified in the Western Regional Corridor Study completed for the Western Utility Group in 1992. These corridors will be designated as utility corridors in the Forest Plan; they are expected to meet the primary electric transmission needs generated by any population increases in the foreseeable future. Effects related to utilities are expected to be the same for all alternatives and are not used to weigh the relative merits of the alternatives.

### Energy Resources Management

Energy was not identified as a public issue, nor are effects related to it used to weigh the relative merits of the alternatives. The potential effects of Forest management direction on energy production and conservation are essentially the same for all plan alternatives. Effects of the alternatives on the availability of fuelwood are discussed in the Timber Management section later in this chapter.

## Lands Program Management

No public lands issues were identified. The potential effects of the various management alternatives on the lands programs are essentially the same except the effects of differing Wild and Scenic River boundaries on the Small Tracts Act program, which are discussed later in this chapter. The potential effects related to the Lands program are not used to weigh the relative merits of the alternatives.

## Minerals Management

This section relates to the following issue:

Issue 21: How will the effects of mining be managed?

The potential effects of mining on Forest resources are related to the type and scope of a proposed operation and would be managed by mitigation measures developed through the project-level NEPA process. Approved operations would meet the requirements of existing federal laws that protect American Indian and other heritage resources, Threatened and Endangered plant and wildlife species, and air and water quality; they would meet State standards under the Surface Mining and Reclamation Act; and they would include mitigations to meet standards and guidelines pertaining to riparian and aquatic resources.

The potential effects of Forest management direction on mining activities are essentially the same for all alternatives. Reductions in road miles would not be expected to affect mineral development, which would generally occur in areas where roads would remain in place. The public involvement and project-level NEPA process required to meet legal requirements, management direction, and standards and guidelines for surface resource protection would likely require longer processing times for plans of operation than in the past and result in approving operating plans with more mitigations. Higher costs associated with obtaining approved operating plans with more stringent mitigation requirements could be expected to result in fewer operations, although the ratio of market value to production costs will ultimately determine how many commercial operations are pursued.

Effects related to this issue are not used to evaluate the relative merits of the alternatives.

## Roadless and Wilderness Area Management

This section relates to the following issues:

Issue 26 How should released Roadless areas (RARE II) be managed?

Issue 27 How will wilderness be managed?

Issue 28 Should the Forest establish additional areas for wilderness management?

Issue 26 is discussed later in this chapter. The potential effects of Forest management direction on wilderness are essentially the same for all management alternatives and are not used to weight the relative merits of the alternatives.

## Trees with Special Management Consideration

This section relates to the following issues:

Issue 32 How will the Forest protect redwood trees?

Issue 33 What plan does the Forest have to ensure the maintenance of Pacific yew?

Issue 34 Has the Forest developed a plan to control *Phytophthora lateralis* and to maintain Port-Orford-cedar?

Management strategies for the redwood and Pacific yew species are the same for all alternatives and are expected to minimize the impacts on the small stands or individual trees. Effects related to these issues are not used to weigh the relative merits of the alternatives.

Effects related to the Port-Orford-cedar root disease (*Phytophthora lateralis*) and control spread of Port-Orford-cedar root disease are discussed under Pest Management in the "Environmental Effects and Mitigations" section of this chapter.

## Special Forest Products Management

Issue 35 How will the Forest ensure the sustainability of special forest products while providing a source of income for local communities?

Issue 36 How will the Forest balance the utilization of special forest products among culturally diverse publics?

Management strategies for special forest products are the same for each alternative. Management activities would be analyzed in project-specific NEPA documents for their potential effects on special forest products. The effects of the management alternatives on these species and the public issues identified above are not used to evaluate the relative merits of the alternatives.

## Pest Management

This section relates to the following issues:

Issue 34 Has the Forest developed a plan to control *Phytophthora lateralis* and to maintain Port-Orford-cedar?

Issue 37 Under what conditions should pesticides (herbicides) be used as a Forest management tool?

Effects of herbicide use are addressed in the final environmental impact statement for vegetative management and reforestation issued by the Pacific Southwest Region in March 1989, and are outside the scope of this EIS. Effects related to this issue are not used to evaluate the relative merits of the alternatives.

Potential effects of Forest management direction on Port-Orford-cedar root disease (*Phytophthora lateralis*) are discussed in the "Environmental Effects and Mitigations" section of this chapter.

# ENVIRONMENTAL EFFECTS AND MITIGATIONS

This section provides detailed discussion of the effects of alternatives in relation to issues where the following conditions were met: (1) the potential effects of the various management alternatives are not similar for all alternatives, and (2) the issues were used to weigh the relative merits of the alternatives.

The discussions are presented by resource elements in the same order as in previous chapters.

# PHYSICAL ENVIRONMENT

## SOILS

### Introduction

Soil is the foundation of all terrestrial life. All the inherent values of the forest ecosystem depend on soil and its productive capacity. Changes in the productive qualities of the soil resource can occur as a result of disturbances arising from management actions on the land. The magnitude of change is associated with the type of disturbance, the size or extent of the affected area, and inherent soil properties. Erosion, nutrient loss, mass movement (landslides), and compaction are effects associated with management-induced changes to soil. Reductions in productivity occur due to alterations of the soil's complex nutrient cycling system, as can occur during broadcast burning. Other disturbances affect the physical characteristics of the soil resource. Compaction and surface erosion are examples of disturbances that modify the moisture holding capacity of soil, reducing moisture available for seedling growth.

Physical disturbances related to timber harvesting practices may increase surface erosion rates by exposing the soil surface. Growing site potential can be lost through soil compaction and loss of topsoil to erosion. Tractor harvesting operations and machine piling slash can compact soils. The use of fire to reduce fuel buildup increases soil exposure and reduces surface organic matter. Nitrogen, usually the most limiting nutrient in tree growth, is lost to the atmosphere when organic matter is consumed by fire. Some activities, like fertilization, improve soil productivity for a short period of time, while revegetation of derelict land surfaces can improve soil productivity long-term.

With timber harvest and removal of the conifer canopy, changes occur in the natural forces regulating slope stability. Timber harvest and the subsequent loss of resistant forces of tree roots as they decay increase the potential for mass movement or debris flows. Road construction can alter hillslope drainage and the distribution of forces that govern slope stability and promote increases in the rate of mass wasting.

### Consequences Common to All Alternatives

### 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 soils, especially in sensitive riparian zones. Intense fire may volatilize soil nutrients. The direct effects on soils from management activities are discussed below.

The effects of fire on soils would be highly variable, depending on the intensity and duration of the fire and the transfer of heat into the soil, which is dependent on the physical properties of the soil. Beneficial effects of low to moderate intensity fires include exposure of mineral soil/ash seed beds for natural tree regeneration, improved nutrient cycling, and reduced levels of some pathogenic micro-organisms. Adverse effects of high to extreme intensity fires would be accelerated erosion due to excessive mineral soil exposure and/or creation of hydrophobic conditions; excessive nutrient volatilization, especially nitrogen and potassium; loss of beneficial micro-organisms; and loss of organic matter for nutrient-holding capacity of the soil.

The effects from livestock grazing tend to be localized. Use of areas by cattle early in spring when soils are high in moisture or in areas where soils are seasonally wet would result in compaction of the surface soil layers. The magnitude of the impact would be greater when the concentration of animals is high or when the period of use is long. Reduced infiltration rates in compacted areas would result in increased surface erosion and, depending on proximity to streams, a higher likelihood of sediment delivery to streams. Changes in vegetation that could result from grazing could reduce soil productivity, especially if the rate of organic matter input to the soil is reduced.

Roads, including tractor skid trails, and log landings are the most significant source of disturbance and

removal of the soil mantle, which could result in soil erosion and increased sediment in streams. This effect would vary by the amount of roads and landings constructed, the season of construction, the type of soils, road surfacing and design, and especially the sensitivity of the soils in which roads are constructed. Constructing roads during the wet period of the year would encourage surface runoff, erosion, and sedimentation. New roads would be highly erodible during the first rains and/or snowmelt following construction.

Roads having high cutbanks would tend to produce more sediment than roads with low cutbanks. Freezing and thawing, heating and cooling, and raindrop action dislodge soil particles that travel into drainage ditches and are transported to streams. Road construction on slopes exceeding 70 percent would often produce sidecast material that could bury downslope vegetation and create droughty conditions, resulting in reduced soil-site productivity. Sidecasting could also cause overloading of the fill slope and subsequent loss of road fills. Improper compaction, and logs and debris in fills could cause road failures. Improper location and inadequate number or size of drainage facilities could increase the incidence of road failures and road surface erosion.

The effects of timber harvesting on soils would vary by logging and site preparation methods. Logging activities, especially tractor yarding, could cause detrimental soil compaction and displacement. Soil compaction would reduce site productivity by reducing the pore space in the soil, create a physical barrier to plant roots, and reduce the infiltration and percolation rates of water into and through the soil. Seedlings growing in densely compacted soils would show longer growth rates compared with seedlings growing in undisturbed sites.

Displacement of soil could occur over large areas during machine site preparation or in smaller areas on skid trails and landings. Machine piling of slash and other site preparation activities could triple the areas of ground disturbed beyond 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, there would be major effects on nutrient cycling.

The amount of soil compaction would depend on the number of acres affected by ground-based logging equipment (for example, tractor or rubber tired skidder) and by the method of post-harvest site preparation. Cable yarding systems move logs with at least one end suspended. These systems would cause less soil disturbance than tractor yarding and could be used on steeper slopes where tractors are not suitable.

## Indirect Effects:

Changes in soil characteristics could affect water quality. An increase in soil compaction, erosion, or displacement could cause an increase in stream sedimentation. The effect of sedimentation on fish habitat is discussed in the Fisheries section of this Chapter.

Reduced site productivity caused by compaction, volatilization, or erosion could, in turn, reduce the growth rate of future stands and could influence the density and diversity of both cover and forage for wildlife. The actual reduction of site productivity cannot be reasonably predicted due to the complex interrelationship among stand stocking, mitigation measures, soil disturbance, natural recovery, climate, and other factors. Changes in soil productivity would be real and may be of long-term consequence, but would not vary significantly by alternative.

## Cumulative Effects:

Impacts to soil productivity occur on site. Offsite effects occur when eroded material or mass movements deliver material to stream systems. Offsite effects due to accelerated erosion and sedimentation are discussed in the water section of this chapter. There are no known impacts to the soil resource from off-Forest management activities.

Separate management actions prescribed for the land have the potential to create soil disturbances that would be cumulative in their effects on soil productivity. Compaction disturbances attributed to site preparation would be in addition to compaction damage from logging operations. Productivity reducing effects of broadcast burning would also be cumulative to compaction damage on the site.

The time required for natural forces to restore compacted soil to normal bulk densities is not known. In environments where freeze and thaw action is present, the upper two inches of the compacted zone

would eventually return to precompacted conditions. In more moderate climates, freeze thaw action would not alleviate compaction. The effects of soil compaction following tractor harvest could last longer than 40 years.

Cumulative effects to soil productivity would be the greatest in those alternatives with the largest timber harvest and road construction. With higher harvest levels, more acres would be compacted by tractor harvest operations, and by road construction and reconstruction. Higher harvest levels would also result in more site preparation activity that could cause soil erosion, nutrient loss from prescribed burning, and the removal of woody material.

## Mitigations Common to All Alternatives

Specific standards and guidelines, presented in Chapter 4 of the accompanying Forest Plan, address the management concerns related to soils. The intent of the standards is to limit the effects of compaction, erosion, and broadcast burning to acceptable limits; that is, to levels of soil loss that do not exceed the creation of new soil or natural accumulation of the elements of soil fertility.

Soil quality standards have been developed by the Pacific Southwest Region of the Forest Service (FSH 2509.18 - Soil Management Handbook). They are in draft form but are being considered direction and are being implemented. The objectives of the standards are to provide threshold values for soil properties and conditions to use as indicators of significant change in soil productivity, soil hydrologic function, and soil buffering capacity, and in turn, to maintain or restore ecosystem health, diversity, and productivity and water quality. The standards specifically aim to monitor and maintain the following attributes of soil: soil cover, soil porosity, organic matter, soil moisture regime, soil hydrologic function, and soil buffering capacity.

Management practices in addition to those required by standards and guidelines could be used to reduce the amount of compaction in harvested units. Such measures include avoidance of the impact by harvesting with cable logging systems, limiting tractor harvest to periods when soil moisture is relatively low, prescribing low-ground-pressure tracked vehicles, and designating skid trails that operators must use during harvest. Alternatives to piling slash by tractor include broadcast burning, lopping and scattering, hand-piling, and shovel and track hoe piling.

Once compaction damage has been sustained, mitigation includes deep subsoil ripping. The effectiveness of ripping depends upon the type of implement used, soil properties, and soil moisture content. Data could be collected to help evaluate the effectiveness of ripping in restoring the productive qualities of compacted soils. Such information is needed to quantify the effects of compaction-related growth reductions in managed stands. Long-term changes in productivity may be evaluated through measurements of tree growth taken at 10 year intervals, and by comparing the results with similar, uncompacted stands.

Mitigation methods for erosion beyond the listed standards and guidelines include water-barring roads, skid trails, and log drag corridors; designating riparian management zones; leaving down woody material; and applying a grass/mulch mixture to areas of exposed soil and bare cut and fill slopes of Forest roads. Using cable systems to reduce acreage harvested by tractors could minimize erosion impacts. Broadcast burning could be timed and executed to avoid removing the duff layer.

Practices to reduce sedimentation in streams include leaving strips of timber and brush along creeks to serve as sediment filters, use of waterbars in situations where channeling could occur, minimizing soil exposure, and spacing culverts frequently enough to prevent water in roadside ditches from traveling long distances. A variety of retaining structures could be used to channel water flow and prevent soil movement. Roads that have served their purpose could be treated for long-term drainage and decompacted so that land that was in roads could again support vegetation. The surface of heavily used roads, or roads in sensitive areas, could be stabilized by paving or surfacing with gravel to reduce sediment production. Landings could be decompacted by bulldozer ripping and planted to improve the conditions for plant growth.

Nutrient losses caused by the removal of woody material could be mitigated by leaving down logs in regenerated areas. Effectiveness of this mitigation is uncertain because the amount of material needed for maintaining long-term soil productivity for different ecosystems has not been determined. Mitigation provides for a minimum level of organic material to be left as a source of organic carbon to fuel the microbiologic populations important to the nutrient cycling process. Base nutrient concentration requirements for different Forest soil types must be

developed to adequately evaluate the impacts of harvesting on nutrient depletion.

No additional mitigations were identified specific to an alternative.

## Consequences Specific to An Alternative

The degree of adverse effect to soils from forest management would depend mostly on the extent of soil-disturbing activities. The most important of these are road and skid trail construction, landing construction, and broadcast burning. These would vary by alternative, as shown in Table IV-1. Other activities, such as mining, and recreation developments, also could adversely affect soils but would not vary by alternative.

Table IV-1 gives the acres expected in roads, landings, skid trails, and broadcast burning, by decade, by alternative. These data assume that 10 percent of timber harvested area will be in skid trails, 4 percent will be in landings, and roads are 40 feet in total width.

# WATER

## Introduction

This section discusses the effects of alternatives in relation to the following issue.

Issue 6 How will adverse cumulative effects on water quality be prevented?

Forest management activities can affect both water quality and water yield. The indicators used to describe the effects on water quality are: riparian and streamcourse protection, miles of road built or decommissioned, acres of timber harvest, cumulative watershed impacts, and watershed improvement proposed under each alternative. Estimated changes in water yield are based on studies in Oregon and Northern California on the effects of timber harvest and road construction on water yield and storm flows (Harr, 1979; Harr et al., 1979; Ziemer, 1981; Wright et al., 1990). The methodology for determining changes in water yield is on file at the Forest Supervisor's Office in Eureka. The methodologies to assess cumulative effects are documented in Appendix B.

## Assumptions Common to All Alternatives:

1. For the cumulative watershed effects assessment, private land was assumed to be completely cut-over, a worst-case assumption. At the scale of analysis presented here—the entire Six Rivers National Forest—the amount and variety of private lands together with the uncertainty of their condition and future management is quite high. Therefore, it is not feasible to refine the analysis of private lands using less-than-worst-case scenarios, even though private lands will never be entirely cut-over. More detailed analysis that will occur during watershed-scale analysis can address private land conditions and potential effects more accurately.

2. Timber harvest units were assumed to have a linear, 30-year recovery period (to allow for regrowth and re-establishment of root support) for the cumulative watershed effect assessment. Roads were assumed not to recover with time.

3. Cumulative watershed effects of various land-disturbing activities have been compared to the effects caused by an acre of road. An activity is assigned a coefficient, called an equivalent road acre (ERA), that is used to compare its effects against those of an acre of road. Roads are assigned an ERA coefficient of 1 ERA/acre. Tractor harvest units are assumed to have effects of 0.32 ERA/acre; cable harvest units, 0.2 ERA/acre. This method essentially yields a description of the land disturbance caused by management activities, expressed in terms of how roads affect land. Actual effects may not be correlated well with ERA values, although there is likely a correlation between amount of land-disturbing activity and watershed effects. Watershed analysis and subsequent NEPA analysis for projects will develop much more detailed and accurate information about cumulative watershed effects.

Sediment models were not used for this analysis because no models presently exist that allow actual sediment yields to be predicted with any reasonable accuracy. Results of sediment modeling would most likely bear little resemblance to real effects and would thus be misleading.

At this scale of analysis, prediction of erosional/sedimentation effects may be quite inaccurate for the reasons mentioned below.

The climate is a major control on erosion and sedimentation, and this cannot be predicted. Major storm events trigger the majority of damaging effects, particularly in the landslide-dominated terrain of the north coast.

The Forest Plan is a broad-scale planning document and does not specify the exact type and locations of all activities. Without these data, the available predictive tools cannot be used with any reasonable reliability. Even when types and locations of activities are known, the predictive tools yield numbers that are of low precision and are based on a string of assumptions that might not be valid. The degree to which erosional problems occur depends largely on the quality of planning and implementation: how management is done. In fact, experience indicates that most of the erosional problems occur as a result of mistakes: normal management practices are not implemented fully or something is missed in designing projects. Sediment models cannot handle this important variable in any useful way.

## Framework for Analysis:

Any activity that disturbs the land surface, changes hillslope drainage patterns at any scale, decreases ground cover, or alters vegetation can degrade water quality and alter water runoff. Activities having the

greatest potential to affect water quality and/or water yield include road construction, timber management, fire management, grazing, mining, and watershed improvement.

**Road construction:** The primary effect roads have on water is causing changes in hillslope stability and drainage patterns. These changes can cause erosion and sedimentation and can concentrate runoff and increase peak flows. Roads expose mineral soil, alter surface and subsurface water flow, create steep cut and fill slopes, and can directly alter stream channels during construction. Where roads cross streams, culverts are normally used to convey water under the road. Culverts present a risk of failure by plugging and overtopping by flood flows, with accompanying erosion and sedimentation to streams. Even well located and well constructed roads usually cause some increased surface erosion and increase the risk of mass-movement erosion. In some cases, gullying and channel scour also occur.

The degree to which these effects occur varies greatly with the location, type and maintenance of any road. The difference in effects between a road that is poorly located, designed, and maintained and a road that is well located, designed, and maintained may be two or three orders of magnitude (hundreds to thousands of times). The majority of the roads on the Six Rivers National Forest were located, designed, and constructed using strict environmental standards and practices that are specifically designed to minimize adverse effects, including geotechnical review of proposed locations. The high-impact roads are primarily those built in the 1950s and 1960s and those on land that was acquired by the Forest Service on which the roads had been built by private logging operators. Intensive inventory efforts are underway to describe the conditions and restoration needs of the Forest road network.

An ongoing program of road maintenance and decommissioning roads no longer needed is now focused on the impacts and risks roads pose to aquatic and riparian resources.

**Timber management:** Timber management activities that have the potential to degrade water quality are timber harvest, timber site preparation, and release treatments. Loss of protective soil cover from ground disturbance can increase erosion and stream sedimentation. Loss of soil root strength on steep slopes can cause debris slides and increased stream sedimentation. Using chemicals for vegetative or insect control can risk water quality degradation through inadvertent application to the stream, storm water runoff, or through vehicle transport accidents. By removing shade canopy, timber harvest can increase stream temperatures, reducing fish survival. Timber harvest also increases water yield because of decreased transpiration of soil water and decreased rain drop interception.

**Fire management:** Prescribed burning removes vegetative cover within burn areas, which exposes the soil to direct surface erosion by raindrop impact. The significance of this varies widely, depending on soils, topography, and rainfall intensity. Burning removes shade canopy and can cause increased stream temperatures. Burning can also increase water yield by reducing rain drop interception and transpiration of water from the soil.

**Grazing:** Grazing by livestock and wild ungulates can result in accelerated erosion and loss of riparian vegetation and stream channel stability. Small amounts of grazing have very minor effects. When grazing is heavy near streams (many animals over long durations), substantial damage to riparian areas and stream channels can result. Grazing effects on water are controlled by controlling the number and type of grazing animals, the season of use, practices that control animal distribution (such as salting and watering), exclosure of animals from sensitive areas, and exclusion of livestock altogether. Water quality degradation and mitigation measures will be addressed in Range Project Decisions.

**Mining:** Mining operations can cause significant degradation of water quality. Disturbed areas can produce sediment and increase turbidity in streams. Seepage or spillage of toxic substances from refining facilities or waste dumps can be toxic to fish and cause a hazard to people.

Management direction for minerals and acreage available for mineral entry do not vary among alternatives; therefore, water quality effects of mining would not depend on the choice of management alternative. Water quality degradation and mitigation measures for mining will be addressed in the project-level NEPA process necessary for approval of operating plans.

**Watershed improvement:** Watershed improvement projects are conducted to improve water quality and stream channel conditions where water is not currently meeting objectives, or where substantial flood risk

exist. Projects include activities such as planting riparian vegetation along streams and on eroding landslide faces; decommissioning roads; upgrading roads, including upsizing and reconfiguring stream crossings; protecting unstable stream banks from scour; and stabilizing gullies. Some short-term adverse effect can occur from watershed restoration when mistakes are made in the design or implementation of the work. These are kept to a minimum by employing interdisciplinary teams that design and review each project and monitor completed projects.

Activities such as trail construction, special forest uses, and recreation have minor effects on water because of their limited scope on this Forest.

## Consequences Common to All Alternatives

## Direct and Indirect Effects:

**Sediment:** The primary water quality concern associated with Forest management activities would be increased sedimentation. Municipal and domestic water use, fish habitat and water recreation activities are sensitive to high sediment levels. The State of California has defined the Klamath and North Coastal Water Basin objective for sediment as follows: "The suspended sediment load and suspended sediment discharge rate of surface water cannot be altered in such a manner as to cause a nuisance or adversely affect beneficial uses." Another related State objective is that turbidity shall not be increased over 20 percent above background levels.

Most management activities increase erosion and sediment delivery to channels to some degree. This is particularly the case for road construction and maintenance. Increased sediment would not always be detrimental to water quality as defined by the beneficial uses. Sediment is a natural watershed product. What is crucial is that the sedimentation processes that operate in a stream be maintained and not thrown out of balance. The amount and timing of sediment, the dynamics of the particular stream channel, and what and where the beneficial uses are determine if increased sediment would be detrimental to water quality. The most important control on sediment is the input from hillslopes, and this is where management activities can have the most effect. Limiting sediment input by limiting on-site soil erosion is central to maintaining stream channel balance and to preventing the kinds of damage to which accelerated sedimentation leads.

Even with implementation of best management practices (BMPs), Forest-wide standards and guidelines, and the land base designations described below, there is potential for adverse effects to water quality because unforeseen circumstances and errors in the application of erosion control and stream protection measures do occur. For example, a landslide hazard area could be inadvertently overlooked or misinterpreted as stable during timber sale layout, and later be triggered or accelerated by management activity; or a waterbar could be poorly located, causing increased erosion. Such events could deposit sediment into a stream and affect water quality. The potential for these impacts increases as more activities such as timber harvest, road construction, and grazing occur. Observations indicate that, in fact, the chief cause of watershed effects are mistakes made in the application of BMPs. The occurrence of mistakes is partly a function of the number and expertise level of Forest staff designing and implementing projects. Staffing levels are subject to budgetary constraints and management priorities. Staff resources can be focused in areas where mistakes are most likely, based on experience, and are of greatest consequence. Watershed analysis will reveal where problems have tended to occur in the past, enabling management of the available workforce to minimize the occurrence of mistakes and their attendant consequences.

Watershed improvement decreases sediment yield in future decades by revegetating bare soil and stabilizing stream banks. Acres of timber harvest (regeneration harvesting and site preparation) and miles of new road construction are the major indicators of increased or high sediment yield. Acres of watershed improvement is the indicator of decreased sediment yield. Alternatives that regulate more areas for timber harvest increase the risk of adversely affecting water quality. These indicators of the potential to increase or decrease stream sediment are displayed by alternative in Table IV-2.

**Beneficial water uses:** We expect that for all alternatives, the overall risk to beneficial uses of water would be low. Monitoring is being conducted to determine the veracity of this prediction, systematically investigating implementation and effectiveness of BMPs applied on the ground over the Forest.

**Water quantity:** The average water yield for each alternative by the year 2010 is shown in Table IV-3. Also shown is the total predicted increase in water yield due to management activities. Past management has increased water yields from the Forest an average of 48,000 acre-feet per year. The current average water yield from the Forest is 5,204,000 acre feet per year. Total Forest water yield and the portion due to management are shown for the year 2010.

Water yields in all alternatives would decrease from current levels because of the reduced timber harvest from historic levels. These decreases in water yield however are relatively small and are believed to be of little or no significance. In very small watersheds, on the order of a few to hundreds of acres, local changes might become significant, but would tend to become undetectable and insignificant as watershed size increases. Local increases might manifest as channel destabilization and downcutting, with attendant downstream sedimentation. Research results are inconclusive as to whether this is an important effect and where we can expect it to occur. We expect that it is most likely where a substantial proportion of a subwatershed is cut over at once or where road density is high and road drainage is inslope-ditch type.

Water shortages for consumptive users downstream rarely exist in this area. In addition, most of any decreases in runoff volume would occur during the fall and winter, when a large surplus of water exists. Water yield increases from management tend to occur in the wetter years. Using these increases would require storage facilities, of which only one exists in the area, Ruth Reservoir. The lack of demand for water in and around the Forest, coupled with the timing of the water yield increases and lack of storage facilities, severely limits any real benefits of any increased water yield from the Forest.

Large peak flows (flood-producing flows) would not be increased considerably as a result of any alternative. Increases in peak flows, if they occur at all tend to occur early in the rainy season on relatively small peak flows (Ziemer, 1981; Harris, 1973; Harr et al., 1982; Rothacher, 1973; Wright et al., 1990). Therefore, increased flooding as a result of Forest management is not a major concern.

## Cumulative Effects:

The cumulative watershed effects assessment is based on the Region 5 methodology, using equivalent road area (see Appendix B for a description of the method used. The Forest was divided into 182 subwatersheds, based on planning delineations called “compartments,” which average just over 5,000 acres in size. For each compartment, a watershed “threshold of concern” (TOC) was determined based on the amount of high and extreme landslide hazard areas, inner gorge, the overall channel stability and the beneficial uses of the stream. Other thresholds were also determined for wildlife and visual quality. The lowest threshold value for each subwatershed established the maximum available acres that could be harvested in each subwatershed. The timber harvest (acres and volumes) were broken down to the subwatershed proportional to the available acres. Recovery was calculated for each decade. The analysis was carried out for 5 decades. The average watershed condition, expressed as the percentage of its watershed “threshold of concern” after maximum harvest in each alternative, is summarized for the first 5 decades in Table IV-4.

The percentage is an average for all the Forest watersheds. The higher the percentage, the closer the average watershed is to its threshold and the greater the watershed disturbance and potential for adverse effects. Notice that all alternatives show the Forest watersheds would improve over time. This is because road construction and harvest would be much lower than during the past 30 years. The watershed threshold of concern was set at a point where, beyond this threshold, the degree of disturbance combined with the sensitivity of the watershed is such that the chance of adverse cumulative effects to stream stability and water quality is thought to be high. In actual practice, this might not be the case; a watershed above the TOC might be in good condition while a watershed below the TOC might not be, but at this level of planning, this is believed to be useful model. This cumulative effect analysis assumes that all items discussed under “Assumptions” above for preventing sediment impacts would be implemented. We also assume that private land is completely cutover, a worst case. Watershed analysis will describe the context for watershed effects and develop the basis for a much more refined and accurate approach to assessing watershed effects. Cumulative impacts will also be analyzed at the project level using actual cutover acres on private land and more refined information about the watershed from watershed analysis.

## Mitigations Common to All Alternatives

Increased erosion and sediment resulting from management activities on the Forest would be maintained within the State water quality limits through the following mitigations.

1. Implementation of best management practices (BMPs) and Forest-wide and Management Area standards and guidelines for all activities that can adversely affect the water resource (See Plan Chapter 4 and Plan Appendix M). Water quality is currently maintained and improved through the application of State-certified and EPA-approved best management practices for controlling non-point sources of pollution of surface waters. A Management Agency Agreement between the Pacific Southwest Region (Region 5) of the Forest Service and the State of California Water Resources Control Board was executed in 1981. This agreement makes the BMPs documented by Region 5 the methods used to achieve compliance with State water quality standards. There are currently 98 practices documented in water quality management for National Forest System Lands in California (1981).

During a project such as a timber sale, grazing allotment, or road building, BMPs are selected and designed based on site-specific conditions so that beneficial uses of water are not adversely affected. For example, BMP 1.11 requires Forest Service staff to prescribe skid trail layouts that avoid unstable areas and prevent concentration of runoff.

Project BMPs are monitored to ensure that the practices are properly implemented and to determine both their implementation and effectiveness in protecting beneficial uses and meeting State water quality standards. A Regional system of BMP monitoring has been developed (Best Management Practice Evaluation Program, May 1992), and it provides a consistent method for investigating and documenting both the implementation and effectiveness of BMPs. Design standards are adjusted where it is found that beneficial uses or water quality standards are not being protected. The implementation of BMPs is the performance standard against which the success of the Forest Service's non-point pollution water quality management efforts are judged. A detailed discussion of BMPs and the implementation process is available from the Forest watershed staff at the Supervisor's Office.

While best management practices address site-specific problems project by project, the need also exists to evaluate Forest management in the broader context of how management affects an entire watershed, including all past, present, and reasonably foreseeable future management actions. This is done both at broad planning levels, as in this Forest Plan, and on each project.

We are using the Regional cumulative watershed effects methodology as an index of management disturbance, expressed in terms that are hydrologically meaningful. It has some value as a generalized risk assessment. However, during project planning, watershed and stream channel conditions are always evaluated and the beneficial uses considered on-site. A detailed on-site analysis of cumulative effects is performed wherever warranted, based on physical indications in the watershed. The objective would be to determine the specific processes, causes, and effects, and any mitigations necessary to prevent adverse environmental effects.

2. Land allocation: An important land designation for water protection is riparian reserves. Lands adjacent to streams are the greatest potential source of erosion and accelerated sediment delivery. In the PRF and OGR alternatives, riparian reserves would be wider than in the CUR, MKT, and ECR alternatives, and would not be regulated for timber harvest. In the CUR, MKT, and ECR alternatives, riparian reserves would be smaller than in the PRF and OGR alternatives, and would be regulated, but at relatively low yields. The primary objective within riparian reserves would be to maintain or enhance the water- and riparian-dependent resources. Water quality, fisheries, and wildlife have a higher value within riparian reserves than timber or other commodities. Under the PRF alternative, vegetation management is allowed only to the extent that is consistent with aquatic conservation strategy objectives (see the Aquatic and Riparian Resource section of Plan Chapter 4). Another important land allocation for the protection of soil and water is that all high and extreme landslide hazard areas are not included in the timber suitable land base.

3. Restoration of areas that are degrading water quality and not meeting State water quality objectives for the Klamath and North Coast basins.

4. Dispersion of management activities so as not to cause adverse cumulative watershed effects.

Additional standards and guidelines that are designed to protect watershed resources may be found in Plan Chapter 4.

Monitoring will be done to determine the implementation and effectiveness of the BMPs and standards and guidelines. The degree to which dispersion of management activities is an effective strategy will be explored in watershed analysis and

cumulative effects analyses done for projects. If water quality is not being adequately protected, either the land base allocations, standards and guidelines, best management practices, or timber harvest scheduling would be changed to prevent further degradation.

The degree to which impacts from timber harvest and road construction occur are to be kept in check and reduced through monitoring and feedback, continual training of practitioners, and maintenance of a staff of water quality specialists who ensure consistent implementation of water quality control measures and detect and correct shortcomings in the implementation and effectiveness of practices.

The degree to which unavoidable impacts occur is highly dependent on how practices are conducted. The Forest's and Region's water quality protection program is focused on ensuring that practices only cause effects at the lowest end of the range, and that the resulting effects are short-term and are of a magnitude such that beneficial uses of water are not adversely affected. For example, during the planning of road construction the location of a road is recognized to be of critical importance regarding the potential to affect streams. On the Six Rivers National Forest, potential routes are thoroughly evaluated by geologists and hydrologists, and road locations are kept in low hazard areas. If a road cannot be located so as to keep water quality effects short-term and without consequence to beneficial uses, helicopter yarding may be done, or the potential timber yield is considered inaccessible and foregone.

The question of the overall effectiveness of BMPs in protecting the beneficial uses of water on the Forest is critically important.

To refine our understanding of the effects of Forest management using BMPs, we are conducting various monitoring programs. A current project involves two "paired watersheds." Both watersheds have elaborate monitoring instrumentation in place. Both watersheds were monitored for several years prior to one of the watersheds having a large timber harvest and roading project take place. The data for the monitoring will provide an answer to the question, "Does the application of BMPs prevent degradation of water quality and adverse effects on beneficial uses?" We currently believe that the answer to this question is a tentative yes, and we expect to continue to test this in broad terms through watershed analysis and in detailed representative sites through rigorous monitoring (See Forest Plan, Chapter 5).

No additional mitigations were identified specific to any alternative.

## Consequences Specific to An Alternative

## CUR Alternative

## Direct and Indirect Effects

Miles of road construction and acres of timber harvest would be the second highest under this alternative. However, timber harvest and road construction would be substantially less than levels during the past 20 years. This would be likely to result in lower sediment yields over the whole Forest than currently exist.

Large contiguous areas of the best timber producing lands would be removed from timber harvest under this alternative. Intensive timber management would be concentrated in the remaining area. These watersheds would generally have lower volumes per acre, because of either low site productivity or heavy brush competition, and more land would need to be harvested for the same amount of timber volume. Site preparation (burning and tractor piling) would be critical for the re-establishment of conifers on the harsher sites. The risk to water quality would be concentrated in a smaller area than in the past. Current (1984 Interim) Standards and Guidelines are less stringent than those proposed for the PRF and OGR alternatives and would, therefore, pose more risk to riparian resources and water quality.

## Cumulative Effects:

This concentration of intensive forest management in a smaller area would make scheduling and dispersing activities to avoid cumulative effects more difficult. The risk of cumulative watershed impacts would be increased on a small portion of the Forest, 10 to 15 of the 185 sub-watersheds, but would decrease over the whole Forest. Timber harvest would be scheduled from the riparian areas under this alternative. Although harvest would occur only where water quality could be maintained, the risk for increase of temperature and sediment from management activities would be higher.

Watersheds were grouped into condition class according their condition as a percentage of their watershed "threshold of concern;" that is, the proportion of Equivalent Road Acres modeled to accrue to the level of ERAs considered acceptable at

this level of planning. The general trend in watershed condition would be that the Forest watersheds improve over time under this alternative. More watersheds move into the less than 40 percent category in the second through fourth decades. Table IV-5 shows the number of Forest watersheds by condition class in each decade for all alternatives.

Scheduling of watershed restoration projects would remain about the same as current levels; the overall potential for water quality degradation would be low.

## PRF Alternative

### Direct and Indirect Effects:

Timber harvest and road construction would be substantially less than levels during the past 20 years. In key watersheds (approximately 72 percent of the Forest), road densities would decrease over time. On the Forest overall, more roads would be obliterated than built in the next 20 years. Roads are the largest cause of increased sediment. The reduction in miles of road and reduced acres of timber harvest would make this alternative one of the best in terms of water quality. This would be likely to result in lower sediment yields than currently exist. Scheduling of watershed restoration projects would increase from current levels, further lowering current levels of erosion and sedimentation. Key watersheds would have the highest priority for restoration projects.

Timber harvest would be concentrated in a limited operating area for the first three to five decades. The intensity of harvest would be much less than the CUR alternative; therefore, the effects would be similar but of much less magnitude than those described above. Because of the decrease in roads and lower harvest levels, the potential for impacts would be much less. Standards and guidelines would provide the highest level of protection to riparian areas and water quality.

### Cumulative Effects:

The risks of cumulative effects would be very low in the later decades. This and the ECR and OGR alternatives would have the lowest potential for cumulative watershed effects. This alternative would have the greatest improvement in watershed condition class, with more watersheds in condition class 1 and less in 3. See Table IV-5.

## OGR Alternative

### Direct and Indirect Effects:

Silvicultural strategies would be similar to those in the PRF alternative but over a slightly larger land base. The reduced timber harvest and road construction from existing levels would reduce the potential for increased sediment to occur as a result of management activities. This alternative has the second lowest acres of timber harvest and miles of road construction and therefore the second lowest expected potential for adverse effects to water quality. Timber harvest funding for watershed restoration would be lower than the CUR, MKT, and ECR alternatives. Watershed restoration would emphasize areas presently causing degradation of water quality; key watersheds would have the highest priority for restoration projects. The potential for increasing sediment would be lower than what would occur under the current direction. The potential for cumulative watershed effects would be similar, although slightly higher than in the PRF alternative. Both silvicultural strategies and management intensity are the same after the third to fourth decades. Standards and guidelines would provide a high level of protection to riparian areas and water quality.

### Cumulative Effects:

This alternative would have the second greatest improvement in watershed condition class (after the PRF alternative), with more watersheds in condition class 1 and less in 3. See Table IV-5.

## MKT Alternative

### Direct and Indirect Effects:

Timber harvest and road construction would be highest under this alternative. The potential for water quality impacts would also be the highest of the alternatives; yet this level of harvest would still be lower than for the past 20 years. Thus, the overall rate of management-induced sedimentation would probably decrease under this alternative. Water quality for the beneficial uses would be maintained or improved where watershed improvement projects could be accomplished. Watershed restoration would increase under this alternative, because funding for watershed restoration would increase due to the relatively high level of timber harvest.

Silvicultural strategies in riparian areas under this alternative would be the same as in the CUR alternative, and the harvest land base and amount would be larger. Harvest would be from higher volume timber site lands, so the pressure for intensive site preparation (tractor piling and burning) would be less than under the CUR alternative. This would reduce the potential for watershed impacts relative to the amount of land managed for timber harvest. Scheduling and dispersing activities to avoid cumulative effects would be somewhat easier than under the CUR alternative because of the larger land base that would be better dispersed throughout the Forest. Because the total amount of harvest and road building would be highest under this alternative, the potential for impacts would still be greater than other alternatives. Standards and guidelines would be less stringent and therefore pose a greater risk to riparian resources and water quality.

### Cumulative Effects:

Watersheds would tend to move to higher condition classes under this alternative, although the majority of watersheds would still be well below threshold levels. See Table IV-5.

## ECR Alternative

### Direct and Indirect Effects:

Reduced timber harvest and road construction from existing levels would reduce the potential for increased sediment to occur as a result of management activities. This alternative has one of the lowest expected intensities of management and over the largest land. The effects on watershed resources would be similar to those described under the PRF and OGR alternatives.

Timber harvest funding for watershed restoration would be lower than under alternatives that harvest more timber. Therefore, watershed restoration would be lowest in this alternative, but the need for watershed improvement would probably be less than under the CUR or MKT alternatives. Watershed restoration would emphasize areas presently causing degradation of water quality. The potential for increasing sediment would be lower than what would occur under the current direction.

### Cumulative Effects:

The potential for cumulative watershed effects would be similar to the PRF and OGR alternatives. See Table IV-5.

# AIR

## Introduction

This section discusses the effects of alternatives in relation to the concern regarding the use of prescribed burning as a fuel treatment and its potential effect on air quality. It also discusses the effects of alternatives in relation to dust from road use and construction activities.

## Consequences Common to All Alternatives

The majority of forest management activities would have little, if any, measurable effects on air quality for all alternatives. Outdoor recreation use, such as campfires, motorboats, or pleasure driving would produce low quantities of pollutants. Large concentrations of residences do not exist within the Forest. Therefore, wood smoke from residential sources would produce a minimal amount of emissions. Typical air flows through the mountains of the Forest would easily disperse these small volumes of pollutants.

## Direct and Indirect Effects:

Fuel treatment activities (specifically prescribed burning) could temporarily produce unacceptable air quality through visibility impairment and elevated amounts of particulate matter. But since the total area treated would be small (less than 5400 acres per year for any one alternative) and spread out across the entire Forest, the negative effects would be minimal and very localized.

Natural fuels treatment may result in longer duration smoke because of burning in understory conditions rather than clearcut blocks, but concentrated smoke would still only persist for one to two days. Low intensity burns would be preferred as a means to prevent unacceptable damage to existing vegetation. Overall emissions would be minimal due to quicker dispersion of smoke because less and smaller size fuels would be consumed. Also, burns for basketweaving materials are typically executed on small (less than 5 acres) tracts of land which would produce minimal amounts of smoke.

Wildfires would occur under all alternatives. Wildfire frequency, intensity, and extent would vary depending on access and intensity of recreation opportunities, the amount of fuels created naturally or left untreated by management activities, the spatial arrangement of these activities, and weather variables. Since wildfires are considered natural events, they are exempt from meeting air quality standards required by the Clean Air Act.

## Cumulative Effects:

There are no known cumulative effects related to air quality from prescribed burning and dust, mainly because of their short duration and dispersed nature. Large area wildfires that continue for several weeks could result in smoke-related health impacts and possible declines in lichen distributions.

## Mitigations Common to All Alternatives

Aggressive fuel treatment programs, that strategically reduce the fuel buildup over large areas, help reduce the possibility of extensive, heavy smoke-producing wildfires.

Prescriptions for prescribed burning are chosen to minimize impacts on air quality and to avoid smoke intrusion into sensitive areas, such as wildernesses or inhabited areas. Burning is only done under favorable meteorological conditions (wind, fuel moisture, temperature, and inversion layers). Once a prescribed burn has been started in a unit, active burning and/or smoldering only lasts for a short period of time.

Increased resource concerns over air quality and habitat preservation have led to strategies of burning under spring-like conditions, which creates less smoke and chance for escape. Increasing utilization and the use of fuel treatment alternatives besides burning would also be explored where they are economically and environmentally feasible.

Road construction and road use by heavy machinery could produce enough dust to impair visibility. Mitigations would include watering down road surfaces, posting signs, and reducing speed limits in areas where activities such as road construction or log hauling was occurring.

No additional mitigations were identified for specific alternatives.

## Consequences Specific to An Alternative

### CUR, MKT, and ECR Alternatives

### Direct and Indirect Effects:

The CUR and MKT alternatives would produce the fourth and second highest total fuel treatment acreages, respectively. The vast majority of the fuel treatments would be timber-related, with only approximately a third of fuel treatments focused on hazard reduction or other resources. By not focusing on aggressively reintroducing fire into the ecosystem, subsequent wildfires could be larger and more destructive.

These alternatives have the highest number of road miles to be constructed. This could result in more opportunities for impaired visibility and possible accidents on roads than in the PRF or OGR alternatives.

### PRF Alternative

### Direct and Indirect Effects:

The greatest number of total fuel treatment acres are projected for this alternative, with the main focus (over 90 percent) on treatments for hazard reduction and other resources. Broadcast burning would be the most typically used fuel treatment method, with the objective of returning fire to the ecosystem. This could result in temporarily elevated emissions, but air quality standards would still be adhered to. Even though this alternative has the greatest number of total acres treated, treatment prescriptions would be designed to retain large woody debris, and thereby reduce emissions. By aggressively reintroducing fire into the ecosystem, this alternative has the potential to reduce the negative effects of subsequent wildfires.

### OGR Alternative

Direct and Indirect Effects:

The total acreage of fuel treatments over 50 years would be the lowest in this alternative. The focus (approximately 78 percent) would be on fuel treatments for hazard reduction and other resources (such as wildlife burns). Treatment prescriptions would be designed to retain large woody debris, and thereby reduce emissions.

### ECR Alternative

### Direct and Indirect Effects:

This alternative has the third highest total acreage of fuel treatments over 50 years, with almost an equal focus on treatments related to timber, hazard reduction, and other resources.

This alternative, along with the CUR and MKT alternatives, has the highest number of constructed road miles. This could result in more opportunities for impaired visibility and possible accidents on roads than in the PRF and OGR alternatives.

# BIOLOGICAL ENVIRONMENT

## BIOLOGICAL DIVERSITY

### Introduction

This section discusses the effects of alternatives in relation to the following issues.

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

Issue 7 How will vegetative diversity be maintained Forest-wide?

Issue 8 How will "old-growth" be preserved?

Biological diversity encompasses a number of biological elements of ecosystem components, structure, and processes. This section discusses the mixture of seral stages by major vegetation type, species diversity, old-growth, stand structure, fragmentation and connectivity. Many other elements are discussed in other sections of this chapter. See the Wildlife, Riparian Zones, and Fisheries sections of this chapter for other discussions regarding biological diversity.

Biological diversity on the Forest is influenced by ecological processes as well as management actions. Forest communities are dynamic; they change over time and space. Successional change and plant stress due to factors such as competition-induced mortality or drought are important factors which can affect the future structure of the forest, rangeland, riparian and aquatic ecosystems. The proportion and type of vegetation in each seral stage will change over time, whether or not management activities occur.

Management activities influence some of the ecological parameters important to biological diversity in the Klamath and California Coast Range Sections/ Provinces. Fire management practices, logging, control of water flows, grazing, road construction and maintenance can affect forest, rangeland, and riparian and aquatic ecosystems; fishing and hunting are also important factors. These activities can be seen as having beneficial or adverse effects on diversity, or may be viewed as a change from past or current conditions.

Natural conditions such as climate, geology, and soils are basic factors that determine an area's capacity to grow vegetation. These factors plus plant distribution and genetic composition determine the potential vegetation of an area. Other variables such as fire, insects, disease, and other ecological disturbances can influence vegetation conditions at any given point in time.

Fire plays a dominant role in creating the diversity that comprises the Forest. The frequent occurrence of low to moderate intensity wildfires can maintain forest openings and densities, regulate the accumulation of coarse woody material, control the abundance of shade-intolerant species that grow under closed canopies, and regulate the available forage and cover for wildlife. Fire also plays a role in fish habitat and population cycles.

Wildfires, fire suppression, and prescribed burning can change vegetation patterns at the landscape level. Stand composition including age, size, and species can be altered by fires or fire suppression. Forest processes can also be altered. These changes can, in turn, affect other forest resources.

Roads and access routes can also affect forest, rangeland, riparian and aquatic ecosystems. Roads may cause fragmentation and affect the movement of wildlife species. Roads may also affect sedimentation levels in streams and alter vegetation recruitment patterns in adjacent riparian and aquatic ecosystems.

Access routes can allow the introduction of non-native plants and animals, diseases, and pathogens. Convenient access can also increase fishing, hunting, poaching, and recreational use. Roads can also provide access to help control damage from natural catastrophes such as floods and fires.

Vegetation manipulation can affect current and long-term wildlife, fish, and plant populations. Logging activities can affect the distribution and dispersal of wildlife and plant populations. Vegetation manipulation that results in an unbalanced distribution of seral stages can subject ecosystems to stress, thereby affecting ecosystem process and function.

## Framework for Analysis and Assumptions:

Four major vegetation series were tracked in the analysis of vegetation by seral stage: tanoak, Douglas-fir, white fir, and red fir. FORPLAN was used to project seral stage changes for these series over the planning period in response to each alternative's proposed management strategies. As we have not completed the EUI mapping project for the Forest and yield projections are not available for these series, timber types in FORPLAN were used as a proxy for vegetation series in the analysis: the Douglas-fir type was used to represent the tanoak and Douglas-fir series; and the mixed conifer type was used to represent the white fir and red fir series, as well as the upper elevation portions of the Douglas-fir series. Table IV-6 shows the percentage of each vegetation series within the timber types. As the Forest completes vegetation mapping in 1995, timber types will be replaced in future analyses.

It was assumed that the number of acres in each vegetation series would not change over time. Hardwood stands, non-coniferous species and non-capable acres were not included in these projections.

The analysis of the distribution of seral stages over time was carried out for the entire planning horizon, 15 decades.

The percent change in each seral stage was calculated by subtracting the number of acres to be harvested under each alternative and projecting the number of acres that would grow into and out of each seral stage. Rates of stand replacement from natural disturbances such as fire and windthrow were estimated from the extent of historic events. Natural stand replacement was determined for each vegetation series and zone by analyzing historical disturbance rates and using fire cycle modeling; the average rate of stand replacement ranges from 0.04 percent per decade for tanoak and Douglas-fir in the north zone to 0.08 percent per decade for Douglas-fir in the south zone.

The PROGNOSIS stand growth model was used to estimate growth rates under various management conditions. Management includes planting, seedling protection, and release treatments. These treatments are considered to be the minimum necessary for plantation establishment following regeneration harvest or reforestation following a natural catastrophe. Intensive management also includes additional treatments, such as the treatment of competing vegetation, and stocking density control (thinnings) to maintain high diameter and height growth rates.

For analysis, it is assumed that intermediate harvesting is assumed to affect successional rates but to have no effect on plant species diversity over the long term.

An estimate of the effects of stand-replacing wildfires are counted as part of the mortality function included in FORPLAN. The FORPLAN model assumes a constant rate of mortality resulting from fires; however, the occurrence of stand-replacing wildfires is erratic and highly variable in space and time. As a result, the actual distribution of seral stages could be different from the projections if a series of large-scale stand-replacing wildfires occurs.

The use of prescribed fire has been primarily limited to wildfire control and fuels treatment following timber harvest. The use of prescribed fire as a direct vegetation management tool is proposed in some of the alternatives. The FORPLAN analysis assumes that stand replacement rates would be slightly reduced in late-successional reserves (from 0.04 percent to 0.03 percent in the north zone, for example) as a result of guidelines in the FSEIS-ROD to reduce risks of large-scale disturbance.

It is difficult to accurately predict changes in diversity given the current level of scientific information available. The projections are most useful for comparing alternatives and should not be used as indications of absolute values.

**Table IV-6. Vegetation Series within Timber Types**

| | Percent of Vegetation Series in Timber Type | | | | | | |
|---|---|---|---|---|---|---|---|
| Timber Type | Douglas-fir Tanoak/Madrome | Pacific Douglas-fir | White fir | Red fir | Jeffrey pine | Hard-wood | Grass |
| Douglas-fir | 63 | 29 | 5 | 1 | 1 | 1 | 0 |
| Mixed conifer | 8 | 38 | 32 | 10 | 1 | 3 | 8 |
| Non-commercial | 15 | 48 | 15 | 9 | 11 | 2 | 0 |

The discussion of consequences and mitigations follows the Chapter 3 order of biological elements: components, structure, and processes.

## Consequences and Mitigations: Components

The discussion of the components of biological diversity includes species diversity, the types of vegetation across the landscape, and the distribution of seral stages in each vegetation series.

## Consequences Common to All Alternatives:

The analysis of components focuses on the distribution of seral stages for the Douglas-fir and mixed conifer timber types in the three zones on the Forest: the north, middle, and south zones.

Seral stage distributions over the planning period for each alternative were compared to the historic range of variability (HRV) for each vegetation series and zone to determine whether management strategies would result in a distribution of seral stages that reflected the HRV. A discussion of how the HRV was developed is included in the Biological Diversity section of Chapter 3. As present climatic conditions are relatively moist, each vegetation series should have relatively more acres in late seral stages than in dry climate conditions favoring more frequent high-intensity fires. Therefore, those alternatives that manage late seral stages at the lower end of the HRV would provide less of a buffer against ecosystem stress in the case of large-scale catastrophic disturbance than alternatives that manage late seral stages towards the upper end of the HRV.

The seral stages described in the Biological Diversity section of Chapter 3 do not exactly agree with the age distributions contained in the FORPLAN model. Therefore, the analysis of consequences discusses the distribution of seral stages according to FORPLAN, and provides estimates rather than exact numbers of how the distributions relate to the HRV for vegetation series in the three zones on the Forest.

All alternatives would comply with the standard and guideline for maintaining minimum quantities of each seral stage within each vegetation type occurring on the Forest. However, this standard and guideline is a minimum threshold to ensure that vegetation is maintained in all seral stages in at least some quantity; and this alone would not provide an adequate quantity and distribution of habitat for wildlife and plant species.

Matrix lands (the timber-suited land base) range from 7 percent of the Forest land base in the PRF alternative to 28 percent of the land base in the MKT alternative. Ecosystem components across the majority of the Forest would be influenced by natural processes and rates of succession. The differences in seral stage distribution over time are mainly a result of the different matrix management strategies and rates of harvest under various alternatives.

A mixture of seral stages throughout the Forest would provide for both horizontal and vertical diversity. The relative percent of the Forest in each major vegetation type would not be measurably changed, although there would be some change from the current situation in distribution for most vegetation types in all alternatives.

The amount of the tanoak series in the old-growth seral stage in the north and middle zones on the Forest is currently below and outside the range of the HRV as a result of past timber harvesting. Under all alternatives, the amount of old-growth in the tanoak series in the north and middle zones would increase and would be aimed towards being within the HRV.

Stand level diversity is expected to be retained on matrix lands in all alternatives due to planting mixtures of naturally-occurring species and relying on supplemental natural regeneration.

The FORPLAN model contains a mortality function that was used to replicate stand-replacing wildfires. Moderate or low intensity wildfires were accounted for in yield tables based on average mortality rates. After moderate or low intensity fires, much of the stand composition and structure may be left on the site. The interaction of the elements remaining from the pre-stand fire with elements of the new stand could cause the stand to function as any seral stage depending on site-specific circumstances.

Due to relatively heavy fuel loadings in drier portions of the Forest, the risk of wildfire occurring is higher in alternatives with lower acreages of hazard-related fuels treatment. These alternatives could decrease the future amount of later seral stages if stand-replacing wildfires occur as a result. The risk of stand-replacing wildfire decreases as the acres of hazard-related fuels treatment increases under different alternatives.

Sugar pine is being affected by the white pine blister rust disease, which may reduce genetic diversity within the species. Sugar pine that are resistant to the disease are available for reforestation activities, but the sugar pine that succumb outside the forest matrix will generally not be actively replaced. Therefore, the ability to plant rust-resistant sugar pine varies with the size of the timber-suited land base in each alternative. Sugar pine occurs as a component of all the primary vegetation types.

## Mitigations Common to All Alternatives:

The Region 5/Region 6 Port-Orford-cedar Action Plan focuses on reducing the rate of disease spread and identifying resistant genotypes for propagation. The control strategy includes methodologies to prevent the spread of spores from infected sites to uninfected sites. See the Trees with Special Management Consideration section of this chapter and Appendix K of the final Plan for more information regarding Port-Orford-cedar and the Region 5/Region 6 Port-Orford-cedar Action Plan.

The sugar pine tree improvement program has a goal to locate and test candidate rust-resistant trees. The intent of the program is to propagate rust-resistant sugar pine seedlings for out-planting in sufficient quantities to maintain sugar pine throughout its range.

## Comparison of Alternatives:

Figures IV-1 through IV-5 show the Forest-wide distribution of seral stages by alternative. Figures IV-6 through IV-11 show the distribution of the late-successional and old-grwoth seral stages over time for the two timber types in the north, central, and south zones.

**North zone Douglas-fir type:** The acres in the shrub/forb seral stage would decrease over the planning period in all alternatives. Acres in the pole stage would increase slightly in the CUR and MKT alternatives, and decrease slightly in the PRF, OGR, and ECR alternatives. Early-mature acres would decrease in the first four decades, undergo a surge in acres for the following four decades, and level off in later decades in all alternatives. The CUR and MKT alternatives would have relatively more acres in the early-mature seral stage than the PRF, OGR, and ECR alternatives.

Acres of all late-seral stages (mid-mature, late-mature, and old-growth) would increase moderately in the first six decades in all alternatives, undergo a surge in acres in the next three decades, decline for three decades, and level off around decade twelve. The acres of late-seral stands would remain near current levels in the CUR and MKT alternatives, and increase from current levels in the PRF, OGR, and ECR alternatives. The acres of old-growth would increase in all alternatives; the PRF alternative would have the largest increase and the MKT alternative the smallest increase over the planning horizon. All alternatives would return the acres of old-growth in the tanoak series within the HRV. The amount in all late seral stages would be towards the upper end of the HRV in the PRF, OGR, and ECR alternatives, and would be towards the lower end in the CUR and MKT alternatives. Figure IV-6 shows the historical and projected distributions of late seral and old-growth stands by alternative.

**North zone mixed conifer type:** Seral stage acreages are fairly similar for all alternatives; this is due to the relatively small number of acres in these vegetation series available for regulated timber harvest in the north zone. The acres in the shrub/forb and pole seral stages would increase slightly over the planning period in all alternatives. Early-mature acres would decrease in the first two decades, undergo a surge in acres in decades four through six, decrease in the following three decades, and then increase and level off in later decades in all alternatives.

Acres of all late seral stages would increase rapidly in the first two decades (due to a pulse of ingrowth from early-mature stands into later seral stages), remain fairly constant for the following six decades, undergo a brief surge, and then decrease and level off around decade twelve. The acres of all late seral stage stands would increase from current levels in all alternatives; acres of old-growth would increase steadily in all alternatives. The amount in the late seral stages would be towards the upper end of the HRV. Figure IV-7 shows the historical and projected distributions of late-seral and old-growth stands by alternative.

**Middle zone Douglas-fir type:** The acres in the shrub/forb seral stage would decrease in the PRF and ECR alternatives, remain fairly constant in the OGR alternative, and increase in the CUR and MKT alternatives. Acres in the pole seral stage would increase initially in the first four decades, decrease in the following three decades, and increase again in later decades. The CUR and MKT alternatives would have a relatively larger increase in pole stands than the PRF, OGR, and ECR alternatives. Early-mature acres would decrease in the first four decades, undergo a

surge in acres for the following four decades, and level off in later decades in the PRF and ECR alternatives; early-mature acres would fluctuate in the CUR, OGR, and MKT alternatives, and would increase in later decades.

Acres of all combined late seral stages in the PRF, OGR, and ECR alternatives would increase moderately in the first six decades, undergo a surge in acres in the next three decades, decline for three decades, and level off around decade twelve. However, the acres of all combined late seral stages would decrease steadily in the CUR and MKT alternatives. The acres of old-growth would increase steadily in the PRF, OGR, and ECR alternatives; the PRF alternative would have the largest increase in old-growth over the planning horizon. Old-growth acres in the CUR and MKT alternatives would increase slightly in the first five decades, decrease in the following four decades, and level off around decade ten; the MKT alternative would have the least amount of old-growth of all alternatives. All alternatives would return the acres of old-growth in the tanoak series within the HRV. The amount in all late seral stages would be in the middle of the HRV in the PRF, OGR, and ECR alternatives, and would be at the lower limit in the CUR and MKT alternatives. The lesser amount of late seral stages in the CUR and MKT alternatives is due to harvest rates that exceed the natural disturbance rates in the middle zone for these series. Figure IV-8 shows the historical and projected distributions of late seral and old-growth stands by alternative.

**Middle zone mixed conifer type:** The acres in the shrub/forb and pole seral stages would continue to increase in the first four decades and level off in the PRF, OGR, and ECR alternatives; shrub/forb and pole acres in the CUR and MKT alternatives would increase over time. Early-mature acres would remain fairly constant in the first five decades, decrease towards decade nine, and increase and level off around decade twelve in all alternatives.

Acres of all late seral stages would remain fairly constant in the first eight decades, and then decrease slightly in the PRF, OGR, and ECR alternatives; late seral acres would decrease steadily after decade four in the CUR and MKT alternatives. Old-growth acres would increase steadily in the PRF, OGR, and ECR alternatives, but would level off after decade four in the CUR and MKT alternatives. Old-growth would increase from current levels in all alternatives; it would be near the upper end of the HRV in the PRF, OGR, and ECR alternatives, and towards the lower end in the CUR and MKT alternatives. The amount in all late seral stages would be towards the middle to lower end of the HRV in the PRF, OGR, and ECR alternatives and would be outside the HRV in later decades in the CUR and MKT alternatives. Figure IV-9 shows the historical and projected distributions of late seral and old-growth stands by alternative.

**South zone Douglas-fir type:** The acres in the shrub/forb and pole seral stages would increase greatly in the CUR and MKT alternatives, moderately in the OGR alternative, and slightly in the PRF and ECR alternatives. Early-mature acres would decrease through decade eight, increase for the next four decades, and level off in later decades in the PRF and ECR alternatives; early-mature acres would fluctuate in the CUR, OGR, and MKT alternatives, and decrease slightly by the end of the planning horizon.

Note that the acres of all combined late seral stages increased rapidly during the period from 1940 to the present; this reflects the combined influence of a more moist climate and to a lesser extent active fire suppression in the last 40 years. Acres of all combined late seral stages would decrease steadily in the CUR and MKT alternatives; acres in the PRF and ECR alternatives would decrease moderately and level off at the eleventh decade; acres in the OGR alternative would decrease until the eleventh decade, and increase towards the end of the planning horizon. The acres of old-growth would increase steadily in all alternatives; the PRF alternative would have the largest increase and the MKT alternative the smallest increase in old-growth acres of all alternatives. All alternatives would maintain acres of old-growth within the HRV; the PRF alternative would be slightly higher than the HRV in later decades. The amount in the mid- and late-mature seral stages would be in the middle of the HRV in the PRF, OGR, and ECR alternatives and would be at the lower limit in the CUR and MKT alternatives. The lesser amount of late seral stages in the CUR and MKT alternatives is due to harvest rates that exceed the natural disturbance rates in the south zone for these series. Figure IV-10 shows the historical and projected distributions of late seral and old-growth stands by alternative.

**South zone mixed conifer type:** The acres in the shrub/forb and pole seral stages would increase in the first four decades and level off in the PRF, OGR, and ECR alternatives; shrub/forb and pole acres in the CUR and MKT alternatives would continue to increase over time. Early-mature acres would decrease in the

first seven decades, then increase and level off around the twelfth decade in all alternatives.

As with the tanoak and Douglas-fir series in the south zone, note that the acres of all combined late seral stages increased rapidly during the period from 1940 to the present; this reflects the combined influence of a more moist climate and active fire suppression in the last 40 years. Acres of all late seral stages would increase rapidly in the first decade (due to a pulse of ingrowth from early-mature stands into later seral stages), and would then decrease and level off in later decades in all alternatives; the PRF, OGR, and ECR alternatives would retain relatively more acres in the late seral stages than the CUR and MKT alternatives. Old-growth acres would increase steadily and then decline slightly in later decades in all alternatives; the PRF alternatives would have the largest increase and the MKT alternative the smallest increase in old-growth acres. Old-growth would exceed the upper end of the HRV in all alternatives; this may indicate that burning by Indians and early settlers reduced the historic amount of old-growth in this zone. The amount in the mid- and late-mature seral stages would progress towards the middle to lower end of the HRV in the PRF, OGR, and ECR alternatives, and would be outside the HRV in later decades in the CUR and MKT alternatives. This is due to the larger number of acres in the old-growth stage. Figure IV-11 shows the historical and projected distributions of late seral and old-growth stands by alternative.

## Consequences and Mitigations: Structure

The discussion of the structural elements of biological diversity includes canopy composition, snags, hardwoods, coarse woody material, vegetation patterns, and fragmentation. Structural elements provide a variety of habitats for plant and animal species.

## Consequences Common to All Alternatives:

Ecological processes and management actions influence both stand structure and vegetation patterns across the landscape. Disturbances such as wildfire, windthrow, disease, and pest infestation can significantly alter stand structure as well as the shape and distribution of stands and seral stages. Timber harvesting and fire/fuels management are the management activities that have the greatest effect on structure.

Regeneration harvesting would be used to some degree in all alternatives. The types of regeneration harvest include green tree retention, shelterwood, and clearcutting. The retention of structural elements such as green trees, snags, coarse woody material, and hardwoods in regenerated stands varies by alternative. Clearcutting would be utilized to various degrees in all alternatives.

All alternatives propose levels of regeneration harvesting well below historical levels on the Forest.

Alternatives that propose more fuels management would have a lower risk of catastrophic wildfire than those with less fuels management. Prescribed burning at low intensities can reduce fuel buildups that elevate the risk of high intensity wildfire. High intensity wildfires which are generally stand-replacing would be similar to regeneration harvests.

## Mitigations Common to All Alternatives:

The National Forest Management Act (NFMA) specifies that limitations be placed on the size of clearcuts. Regeneration units shall be less than 60 acres in Douglas-fir and 40 acres in mixed conifer stands. These size limitations can be exceeded only after public review and approval by the Regional Forester. NFMA also requires an assurance that reforestation of harvested sites can be accomplished within five years. All alternatives would retain some structural elements during regeneration harvest.

## Comparison of Alternatives:

**Canopy composition:** Forest-wide, all alternatives would maintain a variety of stand structures including both even-aged and uneven-aged stands in both the short and long-term. The number of acres managed using various silvicultural systems that would create differing structures would vary by alternative, primarily in matrix lands.

The CUR, PRF, OGR, and ECR alternatives would use green tree retention as the primary method of regeneration. The MKT alternative would generally use clearcutting, with some shelterwood cutting used on harsher sites.

The green tree retention in the PRF and ECR alternatives would comprise 15-25 percent of the area associated with the stand. The retained trees would generally be the oldest, largest trees in the stand. The majority of the trees would be clumped, while others

would be distributed throughout the cutting unit and would function as future snags and, eventually, coarse woody material. The CUR and OGR alternatives would leave six green trees greater than the quadratic mean diameter of the stand. The trees retained in these alternatives would provide late seral characteristics to the regenerated stand, and would provide a multi-storied closed canopy stand earlier than stands regenerated through clearcutting. Clearcutting would only be used in these alternatives where other options are not feasible.

The predominant use of clearcutting in the MKT alternative would result in even-aged stands. These stands would have relatively little horizontal and vertical diversity compared to stands regenerated with the methods used in the other alternatives.

Pre-commercial and commercial thinning performed in the PRF, OGR, and ECR alternatives would be designed to enhance vertical and horizontal diversity and to induce some mortality to accelerate the development of late seral characteristics. The thinning performed in the CUR and MKT alternatives would be designed to maximize commercial harvest yields and would result in stands with less horizontal and vertical diversity.

In general, stands managed using the silvicultural methods in the CUR and MKT alternatives would take longer to develop late seral stand characteristics such as horizontal and vertical diversity, a closed canopy structure, and large numbers of snags and down logs.

**Snags:** Snag densities and population levels of snag-dependent species in areas reserved from timber harvest would vary from low to high levels in all alternatives. This would primarily be a result of natural processes and variation, but management practices such as fuels treatment and firewood cutting would also have an effect in areas where these activities are permitted.

The PRF alternative would have the highest snag objectives of all alternatives, and would retain an average of 80 to 100 percent of the average numbers found on mature and old-growth stands on the Forest. These numbers would vary by vegetation series and seral stage, and could be as low as 40 percent in some matrix areas. Snag objectives would be measured over an area no larger than 40 acres.

The OGR and ECR alternatives would have the second highest snag objectives, leaving 3-6 snags per acre depending on vegetation series and seral stage.

The snag objectives in the PRF, OGR, and ECR alternatives would result in snag levels that are similar to current snag levels on the Forest; these alternatives are expected to maintain population levels of snag-dependent species in matrix areas.

The CUR and MKT alternatives would have the lowest snag objectives, leaving 1.5 snags per acre. This is well below the level of snags found in current stands on the Forest and could reduce population levels of snag-dependent species Forest-wide.

**Coarse woody material:** The PRF alternative would have the highest coarse woody material objectives of all alternatives and would retain an average of 80 to 100 percent of the average numbers found in mature and old-growth stands on the Forest. These numbers would vary by vegetation series and seral stage. Coarse woody material objectives would be measured over an area no larger than 40 acres. The coarse woody material objectives in the PRF alternative would result in down log levels that are similar to current levels on the Forest. These levels may be elevated due to fire suppression over the last 40 years and could result in an increased risk of high intensity wildfires. The risk of high intensity fire in this alternative would be reduced by the treatment of fuels in both matrix and reserved areas.

The OGR and ECR alternatives would have the second highest coarse woody material objectives, leaving 4-6 down logs per acre depending on vegetation series and seral stage. These levels are slightly lower than the down log levels found currently in stands across the Forest and could affect some terrestrial species dependent on coarse woody material in matrix areas. As the acres of regeneration harvest are relatively lower in these alternatives, the negative effects would be much less than in the CUR and MKT alternatives.

The CUR and MKT alternatives would have the lowest coarse woody material objectives, leaving 3 down logs per acre. This is well below the level of down logs currently found in most late seral stands on the Forest and could reduce soil productivity as well as the density and number of terrestrial vertebrates dependent on coarse woody material in matrix areas.

**Hardwoods:** The hardwood component in areas reserved from timber harvest would generally be similar to the current situation in all alternatives. In areas where firewood cutting is permitted, hardwoods could be removed.

In matrix areas, the objectives for hardwood retention would vary by alternative. The PRF, OGR, and ECR alternatives would have the highest objectives for hardwood retention. Hardwoods would be retained as a stand component; the number of hardwoods left would be relative to their abundance in the stand prior to harvest.

The CUR and MKT alternatives would leave occasional standing hardwoods as a stand component to meet specific wildlife habitat needs.

The PRF, OGR, and ECR alternatives would allow for the maintenance of more genetic richness and have less risk of loss due to catastrophic fire. These alternatives would also provide higher habitat capability for hardwood-associated species in matrix areas.

**Vegetation patterns:** The shapes and sizes of stands in areas of the Forest reserved from timber harvest would be influenced primarily by stand-replacing disturbances such as wildfire, insect infestations, or disease.

Patch sizes vary widely across the Forest, due to past harvest activities, topography, geology, soils, and disturbance regimes. All alternatives would comply with the NFMA regulations for the maximum size of regeneration units.

The MKT alternative, which emphasizes the use of clearcutting, would likely have more circular shapes than the other alternatives. Alternatives which use green tree retention and group selection would have more irregular boundaries than the MKT alternative. The PRF and ECR alternatives would emphasize mimicking the shapes of natural stands.

For alternatives using uneven-age prescriptions, created openings would be less than 2-1/2 acres in size.

The green tree retention used in the PRF, OGR, and ECR alternatives would also result in many small openings because a large proportion of the trees covering an average of 20 percent of the area would generally be left in clumps within the harvest unit. The PRF and ECR alternatives would allow larger units to emulate natural stand size as necessary to meet biological diversity objectives. The created openings would be the actual stands, rather than the harvest units.

Stand size on matrix lands in the CUR and MKT alternatives would average about 30 acres, which is similar to the size of current shrub/forb stands but smaller than the size of stands in later seral stages.

For all alternatives, little change is expected in the amount of interior habitat available to plant and animal species Forest-wide. Interior habitat is the portion of late seral forest that is buffered and protected from edge effects.

**Fragmentation:** All alternatives would maintain variable minimum patch sizes that are identified for some MIS species in the habitat capability models (see FEIS Appendix B), depending on the capability of the existing habitat and the needs of specific wildlife species. The PRF, OGR, and ECR alternatives use silvicultural strategies 5 and 6, which include a standard and guideline for minimizing fragmentation across the landscape. The CUR and MKT alternatives do not include this direction and could result in higher fragmentation in the forest matrix as a result of timber harvest activities.

In all alternatives, new road construction would alter vegetation and terrain, making dispersal opportunities for many smaller species hazardous and exposing them to predation. The openings created during road construction and maintenance would also change the ambient air temperature near the road surface, modify wind flow patterns, and alter the amount of sunlight which reaches the forest floor. This would affect certain species which use these areas. The effect would be greater for the CUR, MKT, and ECR alternatives, which have more miles of new road construction, more miles of road maintained on the transportation system, and more miles managed as open for use. The PRF alternative would construct and maintain the least miles of road on the transportation system. The OGR alternative would have the second least miles, followed by the ECR, CUR, and MKT alternatives in increasing order.

## Consequences and Mitigations: Processes

Ecosystem processes include mechanisms such as geomorphical change, species colonization, and disturbance; disturbance occurs over a shorter time frame and has had by far the greatest impact on the vegetation patterns within the Forest. The discussion of ecosystem processes will focus on disturbance, both natural and human-induced, and connectivity.

There are several types of connective habitat at the regional level. Large blocks of land with connectivity provide habitat for species which require interior habitat. Many wildlife species need escape routes and hiding cover to elude predators. Connective habitat can also be used for annual migration or can provide thermal cover.

Some plant and animal species need dispersal routes to provide opportunities for exchange of genetic material during reproduction to maintain species viability and genetic richness. Less mobile species are the most vulnerable to isolation which results from a lack of well-distributed habitat to provide connectivity between the large blocks mentioned above. Examples of animal species needing dispersal habitat are the spotted owl, fisher, marten, black bear, and western pond turtle.

## Consequences Common to All Alternatives:

In all alternatives, stand-replacing disturbances such as high intensity wildfires and vegetation stress, including drought, insects, disease, and competition, would be the primary regulators of vegetation.

Low and moderate intensity wildfires would result in a percentage of stand vegetation being killed or consumed; however, stands would continue to maintain characteristics of the pre-fire stand. The stand might or might not change seral stages.

Rates of successional change in matrix lands would vary with the silvicultural systems used in different alternatives.

Large blocks of land would provide interior habitat for a number of plant and animal species in all alternatives. These include wilderness, portions of the Smith River NRA reserved from timber harvest, and special habitat areas such as HCAs or LSRs. These blocks of land would be managed similarly in all alternatives, and a large proportion of these areas would be in late seral stages due to the limited management activities allowed, except where catastrophic stand-replacing events occur. The blocks would have naturally-occurring levels of fragmentation that differ by vegetation series and zone, but would minimize the amount of edge effect and support species requiring interior habitat in any given seral stage.

Dispersal habitat would be provided in all alternatives and would be achieved through either the 50-11-40 rule or a system of riparian reserves.

It is assumed that fragmentation in either the large blocks of habitat or the dispersal habitat connecting the blocks would not be detrimental to plant and animal species. This assumption is based on the fact that these species evolved in ecosystems that have naturally had some fragmentation as a result of disturbance.

## Mitigations Common to All Alternatives:

Fuels treatment will be used to varying degrees in each alternative to reduce the risk of high intensity stand-replacing wildfires.

## Comparison of Alternatives:

**Seral stage changes:** The rate at which vegetation is returned to an earlier seral stage is important, as it determines the distribution of seral stages for any particular vegetation series. The rate of timber harvest and the type of stands harvested vary among the alternatives and would be the primary influences on rates of succession in matrix lands. Regeneration harvest rates (from clearcutting, shelterwood, green tree retention, or group selection) vary from a low of 410 acres annually for the PRF alternative to a high of 2,560 acres annually in the CUR alternative. The OGR, MKT, and ECR alternatives would regenerate 810, 2,360, and 1,110 acres, respectively, per year.

The rate of harvest in the matrix in the CUR and MKT alternatives would be similar to natural disturbance rates in the south zone, but would exceed natural disturbance rates in the north and middle zones. This would result in more acres in early seral stages and fewer acres in late seral stages than would occur through natural disturbance regimes.

The OGR alternative rate of harvest would slightly exceed natural disturbance rates for Douglas-fir and tanoak in the north and middle zones, but would be much closer to the natural disturbance rates than the CUR and MKT alternatives. The OGR alternative also has a relatively small matrix area and would result in a seral stage distribution similar to the HRV in all zones.

The rate of harvest in the PRF and ECR alternatives would mimic natural disturbance regimes in all zones and would therefore result in a seral stage distribution similar to the historic range of variability.

See the discussion of seral stages earlier in this section for a more detailed discussion of the distribution of seral stages by zones and vegetation types.

**Connectivity and habitat distribution:** The CUR, OGR, MKT, and ECR alternatives would rely on the 50-11-40 rule to provide dispersal habitat between the large blocks of contiguous habitat. The PRF alternative is also expected to meet the 50-11-40 rule, but would rely on the system of riparian reserves to provide dispersal habitat.

All alternatives except the MKT alternative would include travel corridors along riparian reserves and would provide ridgetop connectors for travel among watersheds. These connectors would be managed to maintain functional habitat for dispersal.

The PRF and OGR alternatives include ecological corridors between the large blocks of habitat, and the management strategy in the ECR alternative should maintain ecological corridor conditions. The exact location of the ecological corridors would be determined at a landscape level.

The OGR alternative would have the most acreage in large blocks of reserved lands: approximately 85 percent of the Forest. The PRF alternative would have about 70 percent of the Forest in large blocks. The CUR and MKT alternatives would have 60 and 55 percent, respectively, in large blocks. The ECR alternative would have 45 percent; however, the silvicultural strategies used in the ECR alternative are expected to provide connectivity in matrix lands outside the large blocks of reserved lands.

The PRF and ECR alternatives are expected to have the most acres suitable as linkages between the large blocks of habitat and to provide the greatest amount of connectivity among alternatives; they would be closely followed by the OGR alternative. The CUR alternative would have the second lowest acreage suitable as linkages, and would provide the second least amount of connectivity among alternatives. As the MKT alternative has the largest matrix area and the most intensive timber management practices, it is expected to provide the least amount of connectivity among alternatives.

# WILDLIFE

## Introduction

This section discusses the effects of alternatives in relation to the following issues.

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

Issue 10 How will Forest Plan allocations and their respective management prescriptions affect wildlife?

Issue 11 How should wildlife habitats on the Forest be managed?

Issue 12 How has the ecological corridor concept been treated on the Forest?

This discussion of environmental consequences is based on wildlife management principles, literature regarding wildlife habitat relationships and wildlife ecology, and the California Wildlife Habitat Relationships system (CDF&G, 1990), and it tiers to the FSEIS and ROD, including the FEMAT and SAT assessments that were considered in the development of the FSEIS ROD. Environmental consequences are based on the potential effects activities are likely to have on threatened and endangered species and management indicator species (MIS). The Forest has identified six individual management indicator species and seven assemblages (which include 33 additional species) to evaluate the effects of proposed management actions on forest habitats and unique or special habitat components, and to monitor the effectiveness of the Forest Plan's management area direction and mitigation measures provided in the Forest standards and guidelines. The assemblages were developed to permit the evaluation of specific management activities by determining the occurrence of the members of an assemblage with a single method. A detailed discussion of the habitat relationships of each species occurs in the Wildlife section of Chapter 3, and their respective habitat requirements are identified, for selected species, in the Habitat Capability Models in Appendix B. The wildlife species represented by each MIS or assemblage are listed in FEIS Appendix N.

Effects of proposed management actions are assessed in terms of changes in the quantity and general quality of habitat available to each threatened, endangered, and selected Forest Service sensitive or MIS species.

## Assumptions Common to All Alternatives:

1. The habitat areas identified for threatened, endangered, and selected sensitive (TES) wildlife species, in conjunction with existing reserved land, the large late-successional reserves, and the expanded Riparian Reserves, are expected to support a well distributed array of breeding territories of these wide ranging species that contribute to T&E recovery goals and the maintenance of viable, self sustaining populations of all wildlife species within the Klamath Province. Managing the forest landscape, by province (Forest type) and fire regime, to ensure all successional stages are maintained within desired levels (historic) is expected to facilitate T&E species recovery, and eventually contribute to their delisting. These species are listed in FEIS Chapter 3 and Forest Plan Appendix D.

2. Threatened and endangered species populations are not considered viable until they reach recovery plan levels and are reclassified and removed from federal listing. The viability thresholds of populations are not known for most species. Since few wildlife populations occur on a single forest, conservation assessments and subsequent strategies should cover sub-populations at the province or regional level. Due to this uncertainty, the designation of a well distributed array of suitable contiguous habitat areas for selected wildlife species is expected to maintain adequate numbers of breeding animals through the planning horizon (50 years), providing the Six Rivers National Forest's contribution to maintaining a viable population. The Forest will continue to work in consultation with the USFWS, to incorporate reasonable and prudent measures based on current research in order to ensure the protection and recovery of all federally listed species. Monitoring and research will determine the effectiveness of these assumptions and identify necessary changes or modifications that will be incorporated in amendments to the plan.

There are risks and uncertainties associated with each alternative that would be reflected in the ability of the Forest to contribute to the maintenance of a viable population; the risks range from a low likelihood of maintaining sufficient suitable mature and old-growth habitat, through medium or moderate likelihood (50/50

probability of maintaining sufficient suitable habitat), to a high likelihood of maintaining sufficient suitable habitat. Comprehensive quantitative population viability assessments are generally outside the scope of a forest plan, since most species occur on more than one forest and often cross regional or state boundaries. Available information is generally insufficient or nonexistent on major factors believed to influence a species' viability, including the species' response to different types and intensities of management activities (FSEIS, 1994, page 3&4-237).

The scientific panel on late successional forest ecosystems (Johnson et al., 1991) developed a risk analysis that ranked the probability of retaining functional late-successional/old-growth forest for spotted owls, murrelets, and associated species. Several other teams are in the process of making risk or conservation assessments for other wildlife species or groups of species. These risks are further expanded in the analyses completed in the SAT and FEMAT reports for most wildlife species associated with late successional forests (USDA, 1993; USDA & USDI, 1993).

3. Timber harvest will be conducted on a sustained-yield basis and will be distributed uniformly within the Forest matrix and/or AMA, in areas suited and available for timber harvest. This analysis covers only the land administered by Six Rivers National Forest. In some alternatives, forest management would change most open canopied stands on timber suited land to a closed canopied forest, and regenerate closed canopied forests at rotation ages that generally preclude mature or old-growth forest conditions. Forest management has the potential to improve or accelerate the development of functionally suitable wildlife habitat and mimic, to some extent, the effects of natural disturbances such as fire. Other alternatives would focus on converting poorly stocked open canopied stands to closed canopied multi-storied forest conditions and conducting intermediate harvests in vigorous young and mature stands, with extended rotations (120 to 300+ years). Thinning young and mature stands may affect short-term habitat quality and capability; however, these managed stands are expected to recover and provide functionally suitable habitat within an average of 15 years (within the range of 0 to 30 years), depending on differing species needs and harvest intensity. Regenerating some young and mature forest stands may be needed to bring all successional stages within their historic range of variability (HRV), while providing for recovery of the later successional acreages.

4. The occurrence and abundance of wildlife species is a function of the quantity and quality of suitable habitat and its distribution across the landscape. An activity that benefits one species may adversely affect other species. Non-habitat factors, such as predation, disease, competition, and randomly occurring (stochastic) processes, are not considered in this assessment because they are not well understood for most species and are generally not within the scope of this plan. The magnitude of change in the quantity and quality of wildlife habitat generally indicates the magnitude of change in population levels of wildlife associated with the affected seral stage(s). As habitat quality within a territory improves (habitat capability), home range or territorial area requirements are likely to decrease. Multi-layered closed canopied mature and old-growth forests generally provide higher quality habitat for most forest dwelling species, in the Klamath Province, than do open canopied forests.

5. Effects on MIS species are expected to generally reflect effects on other species that share or use similar habitats. The MIS species and assemblages selected should represent all native vertebrate species on the Forest (Appendix N). Monitoring, adaptive management, and the evolution of "ecosystem management" will refine these MIS species to those that are the most sensitive or responsive to specific activities and are likely to act as "ecological indicators" for essential processes or functions.

6. The "adaptive management process" described in the ISC spotted owl conservation strategy, and included in the FSEIS ROD (Appendix E), would improve management practices by implementing Forest plans in ways that provide opportunities to learn from experience. Active adaptive management, the management program recommended by the ISC, would utilize rigorously designed management experiments that answer ecological questions. Active adaptive management should provide the fastest and most efficient means of determining how the simultaneous goals of maintaining population viability and sustaining forest products can be attained. This process is based on a strong partnership between Forest Service research and management branches and interagency cooperation. It also assumes adequate multi-year funding will be available to initiate long term projects developed at the landscape scale for an array of species and resources.

7. Forest-wide standards and guidelines would be expected to maintain the habitat requirements of wildlife species in general and provide seasonal

protection for essential occupied breeding habitat. These standards and guidelines, in conjunction with the direction for designated wildlife habitat management areas (included in Special and Managed Habitat Management Areas), would be expected to maintain some distribution of contiguous suitable mature forest habitat that supports sub-populations of wildlife in all alternatives.

8. The assemblages of management indicator species were selected to monitor the effectiveness of the standards and guidelines, when management activities affect unique habitats and special habitat components, such as wetlands, snags, and down logs. The species selected are expected to respond with different sensitivities to a wide range of activities and would be monitored using a methodology compatible to all animals in the assemblage. Indicator species are likely to change, as a result of research and monitoring, and may be partially replaced by "ecological indicators" that would focus on ecosystem structures, processes, and functions (draft Ecosystem Management guidelines, USDA, 1994).

9. Fragmentation of large contiguous blocks of suitable habitat and the corresponding increase in "edge effect" reduce the amount and effectiveness of forest interior conditions and eliminate or displace wildlife species dependent on those conditions.

10. Opportunities to increase some wildlife species populations on the Forest are limited, due to a naturally occurring lack of suitable habitat or structural requirements.

11. Fire suppression within large reserves is expected to make the natural disturbance cycle longer than the historic averages for the province. The greater acreages that would eventually be covered by mature and older forests within these reserves should provide the opportunity to maintain some suitable habitat, in the event of periodic large catastrophic fires.

**Activities affecting wildlife and habitat:** The following activities affect wildlife and habitat in general:

**Timber management:** Timber harvest activities (logging or road construction) directly affect habitat quality and quantity for wildlife. The intensity and duration of impacts depend on the quantity, quality, and distribution of trees (living and dead) and down woody material retained in a treated area, size of the treated area, degree of fragmentation of adjacent habitats, and the type and amount of roading required. Silvicultural strategies and their respective standards and guidelines determine the relative quality and quantities of special habitat components (snags, down woody material, and hardwoods) retained within the treated area. Impacts may be beneficial, adverse, neutral, short-term (0 to 10 years, or the planning period), long-term (the planning horizon of 10 to 50 years), and/or cumulative, depending on the actions proposed and the wildlife species affected. Selective treatments have the potential to improve or accelerate the development of functionally suitable habitat.

Wildlife species may be affected indirectly through disturbance caused by the loud noises associated with tree felling, yarding, hauling, and road construction and reconstruction. Some species may be displaced by loud and continuous disturbance in the vicinity of nest and den sites.

**Fire and fuels management:** The ecosystems on this forest have evolved with natural disturbances, and fire has always had some influence on forest succession. Historically, fires occurred on average once every 40+ years (Atzet and Martin, 1991). Fire management has the potential to directly impact habitat quality and quantity when conducting prescribed burning to reduce hazardous fuels accumulations and when controlling wildfires. Techniques for controlling the advance of wildfire must balance the loss of habitat that results from suppression efforts with the potential for continued loss or degradation from the fire. Fire suppression within habitats designated for wildlife affect habitat quality and quantity, and protection objectives (control, contain, or confine) must be determined for these management areas in order to prevent unnatural accumulations of down wood that increase the risk of stand-replacing fires. Fuels management to reduce ladder fuels and the potential for crown fires could influence the size and severity of catastrophic fires, and may be necessary to some extent to protect large contiguous areas of mature forest habitat in late-successional reserves. The use of fire to reduce the quantity of woody debris (fuels) after logging can directly affect habitat quality for wildlife by reducing the quality and quantity of snags and logs. Snags and logs may be lightly charred or completely consumed by the fire, depending on the prior condition of the wood and the intensity and duration of the fire. Snags are particularly impacted by burning excess fuels. They are considered a hazard during fuels treatments and are frequently cut down before the area is burned to prevent roll out from

causing an escaped fire situation below the unit, which could burn additional forest habitat.

There is generally less value for wildlife in charred wood. Charring eliminates or reduces the utility of bark and wood for wildlife because it changes the quality of interstitial spaces (small spaces in bark or wood) used by amphibians, reptiles, and insects, which are in turn fed upon by birds and mammals. Woodpeckers will often forage and even nest in lightly charred trees, but only if they can readily access unburned wood below. The use of fire in fuels management also carries the risk of killing future snags (live cull conifers) intended to eventually serve as snag recruits (within 100 years) and mature hardwoods intended to provide for tree species diversity and mast (tree fruit used for food) production for wildlife. Fuels management through the use of fire also carries the risk of escaped fire, which could potentially impact the forested habitat adjacent to the treated area. Fire suppression allows the accumulation of fuels and down logs, which could increase the risk of high intensity stand replacing fires burning extensive areas.

**Recreation management:** Recreation use poses little threat to habitat quantity or quality at the current level of use. However, recreation use increases noise and human presence, which affects habitat use and, potentially, the reproductive success of wildlife species. Disturbances affecting TES species are the greatest concern. Uses with the greatest potential for disturbance are poaching, developed campgrounds, motorized/mechanized vehicles, high use beach spots along rivers and excessive riverborne recreation (including motorized water vehicles).

**Range management:** Livestock grazing can impact the quantity and quality of forage available for deer, black bear, elk, and some riparian wildlife. Seasonal forage allocations for livestock in addition to year round use by deer may result in localized over-utilization of vegetation. Grazing in riparian and meadow habitats impacts habitat (nesting, resting, and foraging) quality by changing habitat structure and potentially changing plant species composition. It also creates a disturbance for species of wildlife which nest and/or forage on the ground. Another potential impact is the degradation of aquatic habitats resulting from bank destabilization, siltation, removal of riparian vegetation, and pollution from waste matter.

**Minerals management:** Mining has the potential to impact habitat quantity and quality as the result of ground disturbing activities, which often occur in riparian habitats such as seeps and tributaries to streams and rivers. Mining activities impact habitat quality by changing habitat structure and potentially changing plant species composition (if disturbance is severe). Mining also impacts wildlife because of noise and increased human presence, and can expose minerals or create residue that may be toxic to some species.

**Lands management:** The acquisition and release of Forest Service lands has the potential to impact the quantity of various habitats on the Forest. The change in habitat quantity affects the amount of habitat available to support various wildlife species, including threatened and endangered species. There may be opportunities to exchange for lands essential to the protection and recovery of T&E wildlife species and consolidate lands to facilitate ecosystem management and maintain biodiversity.

**Transportation and facilities management:** Road management is essential to reducing disturbance to many species of wildlife, primarily the TES species and wide ranging mammals. Increased roading generally increases hunter access, and poaching, as well as habitat loss. Roads occurring adjacent to sensitive use areas, such as fawning, denning, and nest sites, create disturbance to those areas. Once roads are in existence, it has been difficult to effectively close them; and when roads are barricaded seasonally or permanently, resistance frequently surfaces in the form of vandalism.

Facilities management affects wildlife in the form of potential disturbance. The use of existing facilities and construction of new facilities may result in various levels of disturbance to wildlife depending on their proximity to sensitive breeding habitat.

**Wildlife management:** Wildlife resource management focuses on maintaining viable, well distributed populations of all native wildlife species. This includes the protection of essential habitat and the rehabilitation and enhancement of designated wildlife habitat to ensure self-sustaining wildlife populations distributed throughout the Forest. The Forest also works with the California Department of Fish and Game to establish and maintain harvestable populations of native (elk and deer) and desirable non-native (turkey) wildlife. The magnitude and duration of the effects of habitat management for wildlife vary, and management that benefits one group of species may adversely affect another group (FSEIS, 1994, Appendix J3).

**Management areas:** Land allocations proposed by this EIS would establish management areas, including those identified in the FSEIS ROD. The management direction relative to each management area affects the quality and quantity of habitat for wildlife. Each management area has specific management strategies which vary in their impacts to wildlife and habitat. Permitted activities for each management area are included in Plan Chapter 4. The "Forest matrix" is a term introduced in the conservation strategy for the spotted owl, and is currently defined as land that occurs outside the large reserves (LSRs, Congressionally reserved and administratively withdrawn areas). The Forest matrix acreage varies among alternatives and is generally considered to be those lands outside reserved lands, wilderness, wild and scenic rivers corridors, dedicated portions of the Smith River NRA, and late-successional reserves, depending on alternative.

## Consequences Common to All Alternatives

The primary management objective for wildlife resources is to provide well distributed habitat capable of supporting self sustaining populations of all native and desirable non-native wildlife species that contribute to the maintenance of viable populations. All alternatives are designed to meet this objective, to some extent, and would assume variable levels of risk. Alternatives which have lower open road densities, lower regeneration timber harvest acreage, and a reduced use of fire to lower fuels (woody debris) levels in timber harvest areas would have lower adverse impacts to wildlife dependent on mature and old-growth forests and their components, such as snags and down logs, than alternatives with higher intensities or levels of these activities.

All alternatives contain land allocations for federally listed threatened and endangered species. The number, size, distribution, and management of these designated wildlife areas differs among alternatives. The management of habitat outside land allocated for T&E wildlife (generally referred to as the Forest matrix or adaptive management area) differs among most alternatives.

## Direct Effects:

All alternatives propose to manage some amount of forest land for timber production. Regeneration harvest eliminates mature and old-growth forest habitat and would eliminate, displace, or adversely affect the wildlife species currently occupying those areas. Intermediate harvest generally degrades habitat quality and its capability to support breeding populations for some wildlife species, for up to 15 years or longer, until canopy closure and associated ecologic factors recover. Associated road construction also removes suitable habitat and may create disturbance, and fuels treatment may reduce habitat quality when fire consumes snags and down logs. Harvest treatments also have the potential to improve or accelerate the development of functional habitat. The Forest standards and guidelines establish direction to mitigate adverse disturbance and to retain special habitat components (snags, down woody material, and hardwoods) needed to maintain habitat quality. All proposed activities, including recreation development, mining operations, and range, fisheries, and wildlife habitat improvement projects that would remove or degrade potentially suitable sensitive wildlife habitat, require biological evaluations or assessments, and would incorporate appropriate management area direction and Forest standards and guidelines to mitigate adverse affects.

**Threatened and endangered species:** All alternatives would comply with the recovery plans for the Pacific bald eagle and the peregrine falcon (Pacific population). All alternatives would manage potentially suitable habitat outside designated bald eagle and peregrine falcon habitat management areas for multiple use. Activities in the vicinity of occupied or suspected territories would require a site specific biological assessment and consultation with the USFWS, and would be designed so they are not likely to adversely affect the eagle or falcon.

**Bald eagle:** All alternatives would protect occupied bald eagle nests (four known) and two potential winter roosts. Occupied nest site protection zones (NPZ) range up to 1,300 acres, where no scheduled timber harvest would be allowed (Special Habitat Management Areas). Protection of the nest zones would ensure the continued suitability of the nest site. The nest protection zones, primary disturbance, and feeding areas would be the same acreage for all alternatives (Appendix B, Table 1). Habitat within primary disturbance and feeding zones would be managed differently among alternatives. In general, it would be treated similarly to the General Forest Management Area or matrix, but would be based on a territory management implementation plan developed in consultation with the USFWS. All alternatives would also manage potentially suitable bald eagle habitat that occurs outside designated wildlife areas for multiple uses.

**Peregrine falcon:** All alternatives would protect occupied peregrine falcon nests (nine known). Two alternatives (PRF and OGR) would protect habitat at five additional suspected nest sites. Nest site protection zones at occupied territories average about 1,500 acres where no scheduled timber harvest would be allowed (Special Habitat Management Areas). Protection of the nest protection zones would ensure the continued suitability of the nest site and occupation by breeding adults. The nest, primary disturbance, and feeding zones would be the same acreage in all alternatives. Habitat within primary disturbance and feeding zones would be managed differently among alternatives, but would be based on a territory management implementation plan developed in consultation with the USFWS. In general, it would be treated consistently with the management area direction respective to those areas that comprise the zone, including the General Forest Management Area or matrix. All alternatives would manage potentially suitable peregrine falcon habitat that occurs outside designated habitat management areas for multiple uses.

**Northern spotted owl (NSO):** All alternatives are consistent with the FSEIS and ROD (USDA, 1994), would protect most Critical Habitat Units (CHU) in consultation with the USFWS, and would provide for high population viability based on the recent analyses completed for the FSEIS. The USFWS has prepared a draft Final Recovery Plan for the NSO that may be completed by 1996. The Forest Service completed the Supplemental EIS for the northern spotted owl (USDA, 1994), and Judge Dwyer lifted the injunction against awarding timber sales in suitable spotted owl habitat on June 4, 1994. The strategy for maintaining a viable population of spotted owls varies among alternatives. While alternatives CUR and MKT would maintain the Habitat Conservation Areas consistent with the ISC conservation strategy for the northern spotted owl, they would adopt the passive adaptive management strategy for the Forest matrix and manage the General Forest Management Area intensively under shorter rotations. This strategy would not be expected to maintain spotted owls within the Forest matrix. The remaining alternatives (PRF, OGR, and ECR) would adopt an active adaptive management strategy for the Forest matrix and manage the General Forest Management Area within the historic range of variability using silvicultural strategies designed to create or maintain functional spotted owl habitat. This strategy is expected to maintain breeding owl pairs within the Forest matrix, and provide the scientific documentation on management strategies that are capable of creating or improving spotted owl habitat throughout the forest, including the large late successional reserves (FSEIS, 1994, Appendix J3). Activities that may affect suitable habitat or that are in the vicinity of occupied territories require consultation with the USFWS.

The management of late-successional reserves would benefit the spotted owl, be consistent with late-successional reserve (LSR) direction as identified in the FSEIS ROD, and be done in consultation with the USFWS. Some owls are considered historic because they have not been surveyed within the last five years and it is uncertain if the owls are still present. The forest has identified 100 acre core areas at 93 activity centers outside LSRs Forest-wide. Activity centers that occur on other reserved lands (including Riparian reserves) will be dropped, where the reserved lands provide comparable suitable habitat. The Forest will consult on the management of all designated critical habitat, including that which occurs outside LSRs.

**Marbled murrelet:** Nest or roost site management for marbled murrelet does not vary among alternatives. The Forest standards and guidelines provide protective measures for occupied marbled murrelet sites, and essential habitat (late successional OG 1 and 2, mapped by the Scientific Panel on Late Successional Forest Ecosystems (1991)) would be protected in Marbled Murrelet Zone 1 as LSRs, consistent with direction in the FSEIS ROD. All known nest stands would be protected as LSRs under silvicultural strategy 4. Any management activity within occupied habitat areas would be based on completed territory or habitat area assessments, in consultation with the USFWS, to benefit or at least not adversely affect occupied murrelet nest stands, on lands administered by the Forest Service.

The large late-successional reserves (including Congressionally withdrawn lands) provide protection for 68 percent of the potentially suitable murrelet habitat that occurs on the forest. Suitable habitat is tentatively defined as old-growth forests and mature forests with an old-growth component (large trees, 32 inches dbh and greater) (USDI FWS, 1991). Following consultation with the USFWS, this forest also considers most closed canopy early-mature forest as potentially suitable, since it may have an old growth component. The Forest is working in consultation with the USFWS to identify essential habitat and determine additional management direction needed to ensure the Forest's contribution towards recovery and maintenance of well distributed suitable habitat for

marbled murrelet on the Forest (FSEIS, Appendix J3 pages 3-6). The Marbled Murrelet Recovery Team is currently developing a draft Recovery Plan that is expected to be published in the Federal Register in 1995.

The USFWS has proposed critical habitat for the murrelet (Federal Register, Vol. 59, No. 18 , pages 3811-3823, 1993), and all proposed critical habitat for the murrelet on Six Rivers NF occurs in LSR's. The Forest will review the Recovery Plan when it is completed by the USFWS; the review may identify needed adjustments to the Forest plan. In addition, all project areas within Zone 1 (Near Zone) will be surveyed for murrelets to gather information on their distribution and habitat use on the Forest. While we suspect that most occupied murrelet habitat is likely to occur within Zone 1, inland (Zone 2) surveys would be conducted within suitable forested habitat types to the extent determined during consultation with the USFWS. Additional studies are underway in Zone 2, to determine which timber/vegetation types are not likely to be suitable for murrelet, and planning adjustments will be made as necessary as new information is developed.

There are approximately 456,000 acres of potentially suitable mid-mature, late-mature, and old-growth habitat, as currently defined, on the Forest. Some of the mid-mature (young) forest has older predominant trees that provide potential nest sites. This habitat provides trees with branches large enough for nesting to occur. Approximately 436,000 acres of this habitat is within 35 miles of the coast, with roughly 139,000 acres of this suitable for timber harvest. Approximately 87,000 acres of potentially suitable habitat occurs between 35 and 50 miles of the coast. The marbled murrelet working group recommended two zones, based on observed use and expected occupancy by the marbled murrelet (FEMAT Report, IV-23), which were adopted by the FSEIS and incorporated into the PRF alternative. Approximately 227,000 acres of suitable habitat occur in Zone 1 (Near Zone), which is closest to the Pacific coast, and over 245,500 acres of suitable habitat occur within the inland zone (2 or Far Zone). Only 7,500 acres of suitable habitat in Zone 1 are suited for timber management, while over 42,200 acres of the suitable habitat in Zone 2 are timber suited. Therefore, timber management activities could have an effect on marbled murrelet habitat capability, particularly within Zone 2.

**Candidates for Listing as threatened or endangered:** Habitat management for candidate species does not vary among alternatives except for wolverine, because of its wide ranging nature, and the northwestern pond turtle, which is addressed as an indicator species under the riparian assemblage. Standards and guidelines for each species would protect known occupied sites from habitat degradation and reduce disturbance during the breeding season. Additional information is needed about the habitat relationships, abundance and distribution on the Forest, and population parameters to better assess the adequacy of management strategies for maintaining viable populations of candidate species. Wolverine is known to depend on large expanses of relatively undisturbed habitat; and, while the Siskiyou and Trinity Alps wilderness areas are expected to provide for much of their needs, the adjacent managed forest and the connectivity between wilderness and other set-asides may also be essential. Management of the General Forest Management Area and its effect on habitat quality, quantity, and connectivity for the wolverine would vary among alternatives.

**Forest Service sensitive species:**

**Northern goshawk:** All alternatives, except the PRF, would protect a network of 56 goshawk areas and maintain 200 acres of suitable habitat at all known nest sites. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Exceptions 2., S&G page C-3), that returns administratively withdrawn areas to the matrix and includes a standard and guideline that protects known nest sites occurring in the matrix and AMA. The original network allocated 50 acres of suitable habitat to 18 previously occupied sites and 37 suspected or potential sites. From 12 to 16 designated goshawk areas occur within the Forest matrix, outside the large reserves. Known nest sites (19 nest cores at 200 acres) would be protected in the Special Habitat Management Area (with extended rotations, silvicultural strategy 3 or 4) under most (except PRF) alternatives; however, the management of unoccupied habitat areas and the area outside the nest core would vary among alternatives. The PRF alternative includes a standard and guideline that would protect occupied nest sites in the matrix and maintain suitable fledgling foraging habitat in the vicinity of active nests.

**Pacific fisher and American marten:** The number of fisher and marten management areas and the intensity of management varies between the MKT alternative and most other alternatives. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Exceptions 2., S&G page C-3), that returns administratively withdrawn areas to the matrix.

The Forest had originally delineated 18 fisher habitat management areas and 40 marten management areas based on selected habitat parameters described in "A Literature Review for the Management of Fisher and Marten on National Forests in California" (Appendix B, HCM Tables 13 and 14 - Freel, 1992). The habitat parameters for home range, stand structure, minimum stand size, and habitat spacing distance were used to delineate and evaluate habitat areas for both species. The size, habitat composition, and distribution of habitat areas are based on literature regarding territory size, habitat use, and dispersal abilities, respectively. Habitat capability within all reserved lands would generally improve over the next five decades as young stands mature. Expanded riparian reserves may not be adequate to facilitate dispersal or ensure the re-occupation of vacant habitat management areas.

The implementation of the fisher guidelines resulted in 18 habitat management areas ranging in size from 9,800 to 11,400 acres distributed throughout the Forest. Fourteen of these habitat areas generally overlay spotted owl areas (CHUs which include categories 1 and 2 HCAs for the CUR and MKT alternatives, OG 1 and 2 for the OGR alternative, and late-successional reserves for the PRF alternative). Four additional habitat management areas have been designated outside spotted owl areas (and included in the CUR and OGR alternatives), when the distance between categories 1 and 2 HCAs was greater than the spatial distance guidelines recommended for fisher. Substantial portions of 3 of these areas occur in Wilderness and the Smith River NRA. Habitat capability assessments indicate that 50 percent of the designated areas meet moderate habitat capability. Nine areas currently exist at low capability; however, site specific habitat area evaluations by the Forest's ecosystem classification program have generally found more extensive closed canopy forest conditions which provide improved capability. These management areas are well distributed and would provide sufficient suitable habitat to support successful fisher reproductive units. Forest records indicate that fisher have been reported in or adjacent to 15 of the 18 designated areas.

For the marten, habitat management areas focused primarily on Wilderness and other high elevation mixed conifer set-aside lands, to the extent possible. Critical habitat was incorporated into these habitat areas to the extent possible, and the Forest has coordinated with adjacent Forests to share borderline marten management areas that provide moderate to high capability habitat. For marten, 40 habitat management areas ranging in size from 1,400 to 2,500 acres are distributed throughout the mixed conifer (white fir and red fir) vegetation type on the Forest, and include 3 areas within the redwood type for the subspecies *Martes americana humboldtensis*. The existing reserved areas and spotted owl HCAs or LSRs provide habitat for 20 to 35 of these areas. Three marten areas were included in the PRF alternative as "Managed Habitat Management Areas," and four areas were included in large LSRs on Shasta/Trinity and Mendocino NF, to provide spatial distribution of suitable habitat and to compensate for a large gap between late-successional reserves along South Fork Mountain. Another 20 marten management areas have been identified to meet spatial distribution guidelines throughout the mixed conifer forest; these occur in the CUR and OGR alternatives. The MKT alternative would intensively manage some of these areas under an 80 to 120 year rotation. Several proposed marten management areas would be shared with the Klamath (4), Mendocino (1), and Shasta-Trinity (7) National Forests, and most were absorbed into expanded LSRs. Habitat capability assessments indicate that 80 percent of the designated areas (25 and 7, respectively) meet moderate or high habitat capability. Only 8 areas currently exist at low capability; however, site specific habitat area evaluations by the Forest ecosystem classification program have again found the mixed conifer forests have sufficient canopy closure to provide improved capability. These management areas are well distributed and provide sufficient suitable habitat to support successful marten reproductive units. Forest records indicate that marten have been reported in or adjacent to 8 of the 40 proposed areas.

Available information is insufficient or non-existent concerning the response of either the fisher or marten to many of the factors thought to affect their population viability. Information necessary to perform a viability analysis includes population size, fecundity (ability to produce offspring), survivorship, and dispersal characteristics. The FSEIS ROD direction has a high likelihood of providing sufficient suitable habitat for these species. Maintaining a well distributed array of suitable habitat areas, consistent with the fisher and marten literature review (Appendix B, HCM Tables 13 and 14), and dispersal habitat is expected to ensure that the Forest would contribute to maintaining a viable population for the planning period. The Forest needs to improve its understanding of fisher and marten populations on the Forest and validate the current strategy for maintaining population viability. The management of designated

fisher and marten habitat management areas that occur in the Forest matrix would vary among alternatives, and only the MKT alternative would not provide management areas in the matrix. The need for validating the existing network strategies would be greatest for those alternatives which would have the greatest impact on habitat capability. The impact of management strategies and the schedule for validating the occupancy of designated management areas are discussed under each alternative.

**Great gray owl:** Habitat management for great gray owls would not vary among alternatives. The Forest standards and guidelines, consistent with the FSEIS ROD would provide adequate "protection buffers" that would be managed as LSRs. Essential habitat characteristics would be protected by a no-harvest buffer of 300 feet around meadows and natural openings and a 1/4 mile protection zone around all known nest sites. Specific habitat needs and use are currently unknown for this Forest, since no individuals have been discovered to date. Most of the potentially suitable habitat (mixed conifer forests associated with large meadows) occurs at higher elevations within reserved areas (Siskiyou and Trinity Alps Wildernesses and Smith River NRA). The standards and guidelines for great gray owl provide adequate protection for any nesting pairs discovered on the Forest.

**Willow flycatcher:** Habitat management for willow flycatcher would not vary among alternatives. The Forest standards and guidelines would provide the only protective measures developed at this time. Essential habitat characteristics would be maintained within a 10 acre area around all occupied nest sites. No territorial individuals are known to occur on the Forest. Most of their potentially suitable habitat is expected to occur within the Wild and Scenic Rivers and Riparian Reserves. While livestock grazing is generally a concern for the willow flycatcher, reported sightings on the Forest have occurred in areas closed to livestock. The standards and guidelines for willow flycatcher should provide adequate protection for any nesting pairs discovered on the Forest, until monitoring and research indicate a need for greater protection.

**Species of special concern in the state:** Habitat management for state species of special concern would not vary among alternatives. Standards and guidelines for each species would protect known nest sites from habitat degradation and reduce disturbance during the breeding season. Additional information is needed about their habitat relationships, abundance and distribution on the Forest, and population parameters to better assess adequate management strategies for maintaining viable populations of state species of special concern.

**Harvest species:** The majority of hunting on the Forest is focused on three harvest species: deer, bear, and, to some extent, wild turkey. Roosevelt elk, which are occasionally hunted on private land in this area, may provide opportunities for hunting on National Forest System land in the future. While Roosevelt elk are considered to be more sensitive to habitat change and disturbance than deer, their low numbers on the Forest make deer a more appropriate indicator species. The general habitat requirements for deer are expected to meet most of the needs of elk. The analysis of environmental consequences is, therefore, limited to these species. Habitat management for harvest species would not vary among alternatives.

**Black-tailed deer and Roosevelt elk:** All alternatives would reflect a decline in regeneration acreage (induced foraging habitat) from historic levels (approximately 40,000 acres per decade), as the Forest moves toward ecosystem management, as a result of the increased amount of land allocated to other resources and a reduced emphasis on clearcutting. Periodic stand-replacing fires are likely to create more foraging habitat than timber management. The Mad River and Ruth deer herds would receive the greatest emphasis under all alternatives. Standards and guidelines for deer habitat management would ensure implementation and compliance with existing deer herd management plans developed by the California Department of Fish and Game in the mid-1980s. Monitoring population and habitat trends as described in the standards and guidelines would ensure that populations remain viable and increase the potential for enhancing deer populations. However, management of key deer areas, primarily the creation of induced transitory range to achieve desired forage/cover ratios (Appendix B, Table B-18) that result from different silvicultural strategies or prescribed fire, does differ among alternatives. The design, size, and placement of harvest or burn units, in conjunction with other management areas that occur within a landscape, would determine whether the project would be beneficial or detrimental.

Standards and guidelines for the Roosevelt elk call for the eventual development of an elk management implementation schedule. Presently, the Forest does not support a population of elk; however, the potential

to support small herds or sub-populations exists. No areas are currently designated for elk. The Forest is assessing several areas for potential release sites. The creation of transitory range within the forest matrix would affect habitat quantity and quality for elk and varies by alternative. Elk populations are expected to continue their expansion onto the Forest, facilitated by reintroductions on neighboring Forests (See Appendix B, Table B-17).

**Black bear:** Habitat management for bear would vary by alternative. Standards and guidelines would provide protection for den sites and wallows, but they do not identify a habitat management strategy for black bear territories. Bear populations are dependent upon a mosaic of suitable habitats and successional stages throughout the Forest in a variety of management areas. Since black bear have young every other year, they are slower to recover from population declines than species that breed every year. Open road densities have a major influence on the number of animals harvested and local population dynamics, and areas with high road densities would generally experience declines in black bear utilization. Well designed activities and reduction in open road densities would generally benefit the black bear. All alternatives would construct new roads and decommission some existing roads to reduce open road densities.

**Wild turkey:** The standards and guidelines for wild turkey would maintain essential habitat characteristics within 100-200 feet around key habitual use areas, which include strutting grounds, nest sites, and night roosts. In addition, breeding activities would be protected by seasonal restrictions on loud and continuous noise-generating activities.

**Management indicator species:** Most of the management indicator species are dependent upon special habitat components which would be provided, as mitigation, by standards and guidelines. However, the management of some habitat and habitat components would vary among alternatives. Of the individual MIS species, all are addressed in previous sections except the pileated woodpecker.

**Pileated woodpecker:** Habitat management for the pileated woodpecker would vary among alternatives. The alternatives have no specific management strategy for this species but vary in how they would maintain suitable habitat within the forest matrix by management strategy and by level of green tree (legacy) and snag retention from the standards and guidelines.

**Management indicator species assemblages:** Most of the management indicator species are dependent upon special habitat components which would be provided, as mitigation, by standards and guidelines. However, the management of some habitat and habitat components would vary among alternatives.

**Bog/seep/spring/talus assemblage:** These special habitats would be protected by the riparian standards and guidelines. A minimum 300 foot management area of existing vegetation would be retained around all bogs, seeps, springs, and wet meadows under all alternatives except PRF. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Riparian Reserves, S&G page C-30), which provide buffers of 1 site-potential tree (up to 200 feet) and establishes protection buffers for occupied Del Norte salamander habitat. The Del Norte salamander, a talus associated species, disperse into upland habitat adjacent to talus areas. While buffers would provide some protection to this species, salamanders dispersing beyond the buffer may be adversely affected. Maintaining a 100 foot forested management area with a minimum of 40 percent canopy closure is expected to be adequate to maintain the micro-habitat conditions of these unique habitats.

The indicator species representing similar dependent species is the Olympic salamanders. This species has a small home range and should be minimally impacted by activities occurring from 150 to over 300 feet away from suitable habitat. Riparian Management Scenario 1 should provide dispersal habitat. Protection offered by the standards and guidelines should be adequate to maintain sufficient habitat for most species dependent upon these special habitats. Some species with territorial requirements that are greater than the riparian buffers may be adversely affected.

**Marsh/lake/pond (wetland) assemblage:** All of these special habitats would be protected by the standards and guidelines. A minimum of a 300 foot management area of existing vegetation would be retained around all marshes, lakes, and ponds. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Riparian Reserves, S&G page C-30), that provide buffers of two site-potential trees (up to 400 feet). MIS representing other dependent species are red-legged frog, wood duck, and western pond turtle. These species, while not well known, are believed to have small home ranges, and should be minimally impacted by activities occurring over 400 feet away from open water habitat. Wide riparian

reserves should facilitate local dispersal. Protection offered by the standards and guidelines should be adequate to maintain sufficient suitable habitat for most species dependent upon these special habitats. Species with territorial (area) requirements that are greater than the riparian buffers provide could be adversely affected. Individuals that breed or disperse outside the buffers or travel corridors may also be adversely affected.

**River/stream/creek assemblage:** Protection for species dependent upon these habitats would vary by alternative. Most rivers on the forest are protected under the Wild and Scenic Rivers Act. Other riverine habitats would be protected by the standards and guidelines (which vary by alternative) with an inner gorge or by maintaining a 100 to 300 foot horizontal buffer of vegetation that offers at least 80 percent shade canopy. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Riparian Reserves, S&G page C-30), that provide buffers of 2 site-potential trees (up to 400 feet). Buffers less than 300 feet are generally not adequate to support many riparian dependent species which require forest interior conditions within upland habitat, in addition to riparian riverine habitats for survival. Upland habitat up to two tree heights (estimated at 400 feet for the Six Rivers forest types) from the water's edge on some rivers, streams, and creeks are designated as expanded riparian (travel/movement) corridors for wildlife. The dispersal of some riparian forest interior dependent species would depend on the management of movement corridors, which also varies among alternatives. Species with territorial (area) requirements that are greater than the riparian buffers provide may be adversely affected.

**Snag assemblage:** Snag management would vary among alternatives, but only within the General Forest Management Area. The CUR and MKT alternatives call for managing snags within the General Forest Management Area at 1.5 snags per acre. In all other alternatives and all management areas, snags would be managed at 80-100 percent of background levels (levels found in naturally occurring stands). The PRF alternative follows the standards and guidelines in the FSEIS ROD (Matrix - Green tree and snag retention, S&G page C-41) that provide for 100 percent of the white-headed woodpecker's needs, and would allow 40 percent as the minimum level within harvest units that occur in the matrix. Legacy, or green tree retention, which includes future snags, would vary among the CUR, PRF, OGR, and ECR alternatives and would be absent from the MKT alternative. Species dependent upon snags should not be limited by snag densities in areas managed at percentages near background levels (Table III-13). However, they may be limited by the surrounding adjacent cutover lands' habitat and lands with minimum or threshold levels, where the snags may not persist over time. Maturing stands with little or no legacy are likely to take longer before they begin to provide suitable habitat. Therefore, habitat quality and quantity for snag dependent species would vary among alternatives (See Appendix B, Table B-19).

**Down woody material assemblage:** Management of down woody material would vary among alternatives, but only within the General Forest Management Area and/or matrix. Forest guidelines focus on the retention of decay classes 1 & 2, and assume the older softer decay classes would be maintained to the extent possible under all alternatives. The PRF alternative follows the standards and guidelines in the FSEIS ROD (Coarse woody debris, S&G page C-40), that directed California Forests to use the levels proposed in our draft Forest Plans (see Plan Chapter 4, Biological Diversity), until plant association models have been developed. The CUR and MKT alternatives call for managing down woody material within the General Forest Management Area at 3 logs per acre. In all other alternatives and all management areas, down woody material would be managed at 80-100 percent of background levels (levels found in naturally occurring stands). Again, legacy or green tree retention, which would provide future recruitment of down material, would be absent from the MKT alternative and would vary among the remaining alternatives. Species dependent upon down woody material should not be limited by densities in areas managed at 80-100 percent of background levels (Table III-13). However, they may be affected by the adjacent surrounding habitat that was previously managed with little or no retention of the down wood component. Therefore, habitat quality and quantity for species dependent upon down woody material would vary among alternatives (See Appendix B, Table B-19).

**Black oak/white oak assemblage:** Management of black and white oaks is addressed in the standards and guidelines and would not vary among alternatives. Black and white oaks would be managed for mast production by maximizing the number of mature trees through time. Viable populations of wildlife species dependent upon black oak and white oak habitats would be supported.

**Tanoak/madrone assemblage:** Management of tanoak and madrone is addressed in the standards and guidelines. Pure stands of these hardwoods would be managed to maintain or enhance mast and/or berry production. However, direction for timber resources management includes reestablishing conifers in pure hardwood stands that originally supported conifers. This type conversion could occur under the CUR and MKT alternatives and affect up to 6,000 acres of hardwoods in the Forest matrix. There would be a variety of treatments in these stands of tanoak and madrone, where the hardwoods are a major component. The standards and guidelines (for all alternatives except CUR and MKT) call for maintaining species composition as a part of green tree retention, which would include at least four mature hardwood trees per acre in the mixed evergreen vegetation type. MIS species in this assemblage are primarily associated with tanoak and madrone as components of conifer stands. Management of conifer forests would vary among alternatives, and therefore habitat quality and quantity for the tanoak/madrone assemblage would also vary among alternatives.

**Unique habitats:** Habitats such as caves, mines, and talus slopes provide unique habitat characteristics for wildlife, and some species are dependent upon these habitats for survival. The standards and guidelines for most alternatives protect these special habitats by maintaining a 300 foot management area that maintains essential habitat characteristics around key unique sites. The PRF alternative follows the standards and guidelines in the FSEIS ROD (protection buffers for Del Norte salamander, talus slopes, S&G page C-28, and additional protection for cave and mines for bats, S&G, page C-43). On the Forest, these habitats typically occur as inclusions within the forest or a stand. Maintaining a 300 foot forested management area should be adequate to maintain the micro-habitat conditions of these special habitats.

## Indirect Effects:

Many activities on the Forest have the potential to disturb wildlife, and loud and continuous noises in the vicinity of active breeding sites will displace some species and reduce reproductive success. The Forest standards and guidelines provide mitigation that would implement seasonal restriction on activities in the vicinity of essential occupied breeding territories. Roads can indirectly affect wildlife by disturbance, depending on the season and degree of use. While the management of roads would vary among alternatives, all propose decommissioning and closures to reduce open road densities; most could control access near sensitive nest or den sites. Grazing would continue under all alternatives except ECR, and biological evaluations would be completed when rangeland project decisions are developed and revised. Standards and guidelines would provide protection and mitigation for some species that depend on rangeland resources. Fire suppression within reserved lands will allow a buildup in fuels (down woody debris), that increases the potential for stand replacing fires that would eliminate habitat and displace breeding pairs.

## Cumulative Effects:

All alternatives would harvest timber, construct roads, and treat fuels from suited land that occurs in the General Forest Management Area, which is generally the timber suited portion of the Forest matrix. All alternatives would harvest young, mature and old-growth stands that occur in the forest matrix and eliminate or degrade suitable wildlife habitat that is not considered essential to the respective alternative's goals and objectives. Alternatives PRF, OGR, and ECR assume that the degradation resulting from individual tree selection (ITS) would make the stand non-functional wildlife habitat for an average period of 15 years and that, with snag and down woody material retention, when the canopy closure and understory recovers the stand would become "functional" wildlife habitat again. The amount of land and habitat treated would decrease substantially, under all alternatives, from previous timber harvest levels. All alternatives would regenerate poorly stocked open canopy stands to create well stocked closed canopy conifer stands managed at different rotation ages. All alternatives would suppress fire and manage fuels to protect the mature forests, especially those in reserves, recognizing that an accumulation of fuels could result in greater risk of stand replacing fires. The closed canopy mature forest condition would generally provide higher quality habitat for most forest species.

This document tiers to the FSEIS and its ROD, (including the additional analysis in Appendix J). While the Forest Plan provides direction for all land allocations, all ground disturbing activities will be conducted only after site specific environmental analysis. Actions that occur on National Forest System land may affect wildlife on nonfederal lands; however, the Forest Service has no authority to regulate activities on lands other than those they

administer. The Forest will continue to work in consultation with the USFWS, and in cooperation with neighboring land owners to minimize adverse effects to federally listed species.

Table IV-7 provides the data related to habitat, populations, and protected areas on which the following analysis is based. It also indicates some quantitative data about the effects of the various alternatives.

## Mitigations Common to all Alternatives

Management area direction provides specific mitigation measures to protect essential suitable habitat and maintain self-sustaining populations. In addition, the Forest standards and guidelines (which include habitat capability models) provide species-specific mitigation and establish guidelines that will direct the design and subsequent management of essential designated wildlife habitats, special and unique habitat components from a landscape perspective. Riparian Habitat Conservation Areas will be determined as part of the watershed analysis conducted in the PRF alternative. Additional mitigations are identified specific to alternatives in Table IV-7.

## Consequences Specific to An Alternative

General information is presented for each alternative. The direct effects following the general information in each are presented in the same order as in the preceding direct effects discussion: T&E species, Forest Service sensitive species, harvest species, management indicator species, management indicator species assemblages.

## CUR Alternative

The CUR alternative would use silvicultural strategies 1, 2, 3, and 4 in the wildlife management areas. These strategies are described in detail in Appendix F. Table IV-8 shows how these strategies would apply to six species and the corridors, and it indicates the number of habitat areas which the strategies would protect.

**Table IV-8.**
**Silvicultural Strategies for Wildlife - CUR**

| Habitat Management Area | Zone and Silvicultural Strategy (SS) | Areas Protected |
|---|---|---|
| **Special Habitat** | | |
| Bald eagle | Nest: SS 4; other: SS 2 | 6 |
| Peregrine falcon | Nest: SS 4; other: SS 2 | 8 |
| Spotted owl | CHU/Cat. 1&2 HCAs: SS 4 | 8 |
| | Category 4 HCAs: SS 4 | 91 |
| **Managed Habitat** | | |
| Northern goshawk | Nest: SS 3; other: SS 2 | 56 |
| Pacific fisher | SS 3 | 18 |
| American marten | SS 3 | 40 |
| Wildlife Travel Corridors | SS 2 | — |
| Ecological Corridors | NA | — |

## Direct Effects:

This alternative would continue the present management strategy, which has resulted in the Forest's current condition. This alternative would be expected to contribute to the recovery of most currently listed threatened and endangered wildlife species (bald eagle, peregrine falcon, and spotted owl); however, only 43 percent of the suitable marbled murrelet habitat would be protected within current set-asides. This alternative would also assume a greater risk of not contributing to the viability of some Forest sensitive species that are dependent on mature or old-growth forests or their special habitat components. Timber harvest of Pacific fisher, American marten, and northern goshawk habitat that occurs outside reserved lands, CHUs, and designated wildlife habitat management areas may reduce habitat capability, displacing breeding individuals and resulting, over time, in isolated territories or sub-populations.

The CUR alternative adopts a "passive adaptive" management strategy, providing designated habitat management areas which would be protected or managed under extended rotations for some wildlife species dependent on mature and old-growth timber and intensively managing the remaining general forest for timber production. This alternative would regenerate an average 16,500 acres per decade and intermediate harvset up to 2,000 acres per year. Lands

regenerated under silvicultural strategy 1, with harvest rotations of 100 years, would never provide mature closed canopy forest conditions. Lands thinned and regenerated under silvicultural strategy 2, with 120-140 year rotations, would provide some young closed canopy forest. Silvicultural strategy 3 is a selective strategy that would generally maintain mature forest conditions over a 300 year rotation period. Mature stands on lands unsuitable for timber production (silvicultural strategy 4) would continue to grow into old-growth and eventually (300-500 years) decline as the conifer component dies and is partially replaced by hardwoods, or consumed by fire.

Some options would be maintained to redesign habitat management areas or to allocate additional mature forest habitat to meet changing needs during the first decade. Federal listing of other candidate wildlife species is likely to result in the designation of additional protected forested land within the Forest matrix. Some essential territories could be eliminated or displaced and some opportunities to allocate habitat in some areas would be foregone after the first decade. Ingrowth from younger stands would occur forest-wide, increasing the quantity and quality of mature forest conditions within categories 1 and 2 HCAs and CHUs. Figures IV-12 and IV-13 show how the mature and older forest strata acreages would decrease under this alternative (see end of Wildlife section for Figures IV-12 through IV-17). Refer to Table IV-7 for a display of management strategies, populations, and some effects on the following species and assemblages under the CUR alternative.

**Threatened and endangered species:**

**Bald eagle:** Primary disturbance and feeding zones would be managed to have neutral or beneficial effects on the bald eagle.

**Peregrine falcon:** Primary disturbance and feeding zones would be managed to benefit or at least not adversely affect the peregrine falcon. Recovery of the species would be slow, and all newly occupied habitat would require protection until seven breeding pairs were active each year.

**Spotted owl:** Timber suited portions of the Forest matrix would be managed intensively under silvicultural strategy 1 (100 year rotation), strategy 2 (120-140 year rotation), and strategy 3 (ITM or group selection at 300 year rotation). Suitable spotted owl habitat within the Forest matrix would be eliminated by silvicultural strategies 1 and 2, and degraded under strategy 3. The 100 and 140 year rotations would not be expected to provide functional mature closed canopy forest during a rotation, and the ITM cuts under strategy 3 would, in the short-term, degrade mature closed canopy forests. The mosaic of management areas under the different strategies would be likely to maintain some owl pairs; however, the Forest matrix would not be expected to support sufficient breeding owl pairs to permit extensive entries into categories 1 and 2 HCAs in the future.

This alternative would result in a reduction of suitable spotted owl habitat. Suitable habitat would decrease 30 percent in the Forest matrix during the next 5 decades, and 10 percent Forest-wide (see Figure IV-12). Acres of suitable habitat Forest-wide would fluctuate, since the decreases within the Forest matrix would be partially compensated for by young timber stands throughout the Forest reaching maturity during this period.

Some of the spotted owls (including owls in category 4 HCAs) in the Forest matrix would be adversely affected by the elimination or degradation of suitable habitat, and some would be expected to be displaced when the acreage of suitable habitat remaining could no longer support breeding owls. Spotted owls using category 4 HCAs in the Forest matrix would be adversely affected by the elimination and fragmentation of suitable habitat around them. Fifteen additional pairs of owls could be expected to occupy NSO CHUs Forest-wide.

The northern spotted owl EIS (USDA, 1992) shows there is a high likelihood that population viability would be maintained by protecting all suitable habitat within categories 1 and 2 HCAs and NSO CHUs.

**Marbled murrelet:** There would be a conflict between proposed harvest activities and maintaining existing levels of marbled murrelet habitat capability within the Forest. Mid-mature, late-mature, and old-growth forest within 35 miles of the coast would increase by 2 percent Forest-wide but would decrease by 29 percent within the Forest matrix by the fifth decade (Figure IV-14). Habitat would be fragmented. Fragmentation and loss of habitat within the Forest matrix could adversely affect movement and dispersal, and could eliminate future options for management for the murrelet once the USFWS determines critical habitat needs. Critical habitat would be likely to require the protection of additional mature and old-growth forest that occurs within the Forest matrix.

The Scientific Panel on Late-Successional Ecosystems (Johnson et al., 1991) found that similar alternatives would have a medium/low likelihood of maintaining adequate habitat for the murrelet, and there is a moderate likelihood that the Forest would contribute to maintaining a viable population.

**Forest Service sensitive species:**

**Pacific fisher:** Suitable habitat would decrease 27 percent in the Forest matrix during the next 5 decades; it would increase 6 percent Forest-wide during the first 4 decades, decrease through decade 7, and increase towards decade 10 (see Figure IV-15). Forest-wide, the changes would be gradual, since the decreases within the Forest matrix would be compensated for by young timber stands throughout the Forest reaching maturity during this period. Loss or degradation of suitable habitat in the matrix may result in lower reproductive success or displacement from designated habitat. Unoccupied suitable habitat may not be recolonized. Unless the 50-11-40 habitat is somewhat contiguous, it may not be adequate to facilitate dispersal through the matrix between designated habitat management areas.

The Scientific panel (Johnson et al., 1991) indicated there was a medium likelihood that sufficient suitable fisher habitat would be maintained under this type of alternative. However, the designation of a well distributed array of fisher habitat management areas (including the Forest matrix), consistent with the Pacific Southwest Region's (PSW) literature review, would provide a higher likelihood that the Forest would contribute to maintaining a viable population.

**American marten:** Suitable habitat would decrease 35 percent in the Forest matrix during the next 5 decades, and 9 percent forest-wide (see Figure IV-16). Forest-wide, the declines appear gradual, since the decreases within the Forest matrix would be partially compensated for by young timber stands throughout the Forest reaching maturity during this period. The loss or degradation of suitable habitat within the Forest matrix may result in lower reproductive success or displacement of breeding marten in the matrix. Unoccupied suitable habitat may not be recolonized. Expanded riparian corridors and 50-11-40 habitat would probably not be adequate to facilitate marten dispersal between designated habitat management areas, which would be located primarily along major ridges.

The Scientific panel (Johnson et al., 1991) indicated there was a medium likelihood that sufficient suitable marten habitat would be maintained under this alternative. However, the designation of marten habitat management areas Forest-wide, including within the Forest matrix, consistent with PSW's literature review, should increase that likelihood, and would be expected to provide a higher likelihood that the Forest would contribute to maintaining a viable population.

**Northern goshawk:** The guideline that would maintain relatively contiguous mature forest foraging habitat at active nests would not be implemented under this alternative. While the occupied nest core is expected to change through time, the managed replacement habitat provided by silvicultural strategy 2 would be only moderately suitable, and adjacent foraging habitat would be a predominantly younger forest. This management strategy would be similar to category 4 HCAs established for the spotted owl, and, as a passive adaptive management strategy, would not be expected to maintain active goshawk territories within the Forest matrix.

**Wolverine:** Suitable mature forest habitat outside categories 1 and 2 HCAs, reserved areas, and NSO CHUs would decrease, and the 100 year rotation used on the timber suited lands would not provide mature forest conditions. The reduction of suitable habitat in the vicinity of large undisturbed management areas and the limited ability of expanded riparian corridors or 50-11-40 habitat to facilitate movement and dispersal within the Forest matrix might adversely affect the wolverine.

**Harvest species:**

**Black-tailed deer and Roosevelt elk:** Silvicultural strategies 1 and 2 provide the open early succession vegetation and edge habitat preferred by deer for foraging. The CUR alternative would initially increase sharply from the current acreage in plantations, and would then level off in future decades (see Figure IV-17). These silvicultural strategies would also put reduced emphasis on the protection and maintenance of optimal cover. The design, size, and placement of harvest units, in conjunction with other managed areas that occur within a landscape, would determine whether the project would be beneficial or detrimental. From a landscape perspective, forage/cover relationships and local deer populations would be expected to decline slightly from historic levels, and stabilize after three decades, as a result of reduced regeneration treatments and the increase in acreage allocated to mature and old-growth wildlife species. Forage areas would mature in the HCAs, and deer

densities would be expected to return to historic densities, with occasional episodic increases in response to catastrophic fires. Elk populations would be expected to continue their expansion onto the forest, and might locally replace deer.

**Black bear:** This alternative would maintain large forested refugia in reserved and set-aside lands. Management of the Forest matrix would provide increased early successional habitat for foraging, with a corresponding reduction of the older overmature stands and large down logs used for denning and foraging. The design, size, and placement of harvest units, in conjunction with other managed areas that occur within a landscape, would determine the extent to which the project is beneficial or detrimental. Reduction of foraging habitat within the protected lands and intensive management, including road building, within the Forest matrix might adversely affect the black bear or its habitat. Well designed activities and reduction in open road densities would generally benefit the black bear.

**Management indicator species:**

**Pileated woodpecker:** This alternative would retain special habitat components, specifically snags and down logs, at 1.5 snags and 3 logs per acre within the General Forest Management Area. From a landscape perspective, reserved lands and HCAs would support the woodpecker. The Forest matrix would be expected to provide some suitable nesting and foraging habitat; however, contiguous areas of sufficient size and distribution would be limited and the current population would be expected to decline as a direct result of the reduction in suitable habitat and reduced habitat capability (Appendix B, Table 5) resulting from minimal snag retention levels.

**Management indicator species assemblages:**

**Riparian Management Area (RMA).** Timber harvest could degrade habitat quality for some species, but management area direction and standards and guidelines would be expected to maintain suitable habitat conditions for most riparian species. Wildlife species that have area requirements for breeding, feeding, or dispersal that exceed the RMA buffer widths would be adversely affected or displaced.

**Snag and down woody debris:** Snags and down woody debris retention levels would reduce habitat capability for some wildlife species, in addition to the effects that would result from the associated harvest strategy of regeneration (silvicultural strategy 1). This level of snag and down log retention would still be expected to maintain moderate habitat capability for most snag dependent wildlife (Appendix B, Table 7) and those that require down woody material. The legacy guidelines would also provide some opportunities for future snag recruitment. This would be expected to result in reduced population densities of cavity nest wildlife within the Forest matrix.

**Biological diversity:**

**Habitat diversity and habitat fragmentation:** The overall effect from harvest of old-growth forests under this alternative would be increased fragmentation, isolation, and reduction in size of mature and old-growth stands throughout the Forest matrix. Habitat diversity within the Forest matrix would be reduced. Duration of these effects would be at least 200 to 300 years before harvested areas would contain the structural characteristics and the habitat function of the original old-growth forest ecosystem. Harvest would reduce interior forest habitat (those areas not influenced by deleterious edge effects) throughout the Forest matrix. The location of harvest units would affect habitat diversity and maintenance of old-growth forest wildlife habitat. This alternative has no provisions for locating harvest units in a manner that would reduce fragmentation as much as possible in a managed setting. The cumulative effects from harvest on interior old-growth forest would seriously compromise the integrity and effectiveness of this habitat as a component of old-growth associated species.

The CUR alternative does not provide ecological corridors; therefore, fragmentation from a landscape perspective would also be increased. The stream management units would generally not be wide enough to provide interior forest habitat. Habitat structure might be decreased as a result of the proposed harvest for these areas, and their location relative to the patches of old-growth habitat in the landscape might not always provide an effective linkage. Because of fragmentation, the managed Forest matrix would not provide for dispersal of those organisms requiring continuous linkages of old aged or closed (or near closed) canopy forest conditions, particularly those species with limited mobility. Therefore, linkage of old-growth habitat on the landscape level would be jeopardized, and might adversely affect the viability of some species' populations on the Forest.

**Ecological corridors:** This alternative does not designate ecological corridors. Dispersal would be expected to occur throughout the Forest matrix, which includes 50-11-40 habitat and the expanded riparian areas. There would be no requirement that 50-11-40 habitat be contiguous, and resulting gaps in continuous forest cover would be barriers to some species. Timber harvest could create barriers to dispersal, and vacant habitat areas might not be recolonized for decades or remain unoccupied. Mortality of dispersing wildlife requiring closed canopy forested conditions would be expected to increase.

## Indirect Effects:

Approximately 6,850 acres of habitat allocated for the Dedicated Wildlife Habitat Management Area, outside reserved land and CHUs, would result in a slight reduction in the amount of land available for timber management. Open roads would reduce habitat capability for several species of wildlife, from disturbance and fragmentation. Most of the road construction would be expected to occur during the first two decades, with 200 miles proposed for the first decade and an additional 165 miles by the fifth decade. The Forest would decommission about 100 miles of roads during the first decade, but this would not be expected to compensate for the new road construction. Recreational opportunities associated with wildlife viewing and hunting would increase as access to previously unroaded areas is developed. The increase in open road densities within the Forest matrix would result in disturbance to some wildlife and could displace species that are sensitive to disturbance.

## Cumulative Effects:

Regeneration at the 100 and 140 year rotations implemented on areas managed for timber under silvicultural strategies 1 and 2, respectively, would provide a continuous mosaic of young forest habitat for those wildlife species dependent on the earlier successional stages. Habitat for those species dependent on mature or old-growth forest habitat would occur primarily within protected reserved lands and designated critical habitat and would decline during the next few decades within the Forest matrix. The transportation system within the forest matrix would be nearly complete at the end of the second decade, and the increased open road densities could displace some wildlife species into the large set-asides.

## PRF Alternative

The PRF alternative would use silvicultural strategies 3, 4, and 5 in the designated management areas. These strategies are described in detail in Appendix F. Table IV-9 shows how these strategies would apply to six species and the corridors, and it indicates the number of habitat areas which the strategies would protect.

**Table IV-9.**
**Silvicultural Strategies for Wildlife - PRF**

| Habitat Management Area | Zone and Silvicultural Strategy (SS) | Areas Protected |
|---|---|---|
| **Special Habitat** | | |
| Bald eagle | Nest: SS 4; other: SS 5 | 6 |
| Peregrine falcon | Nest: SS 4; other: SS 5 | 14 |
| Spotted owl | LSRs/Critical Hab. SS 4 | 9 |
| | 100 acres A/C. SS 4 | 93 |
| Marbled murrelet | [1]LSRs/Critical Hab. SS 4 | 9 |
| Occupied habitat | SS 4 | 3 |
| **Managed Habitat** | | |
| American marten | SS 5 | 3 |
| Del Norte salamander | unmapped protection buffer | — |
| Critical Owl Hab. in matrix | SS 5/Consultation | |
| Hayfork AMA | Experimental | |
| Riparian Reserves | SS 4 | |
| Wildlife Travel Corridors | SS 5 | — |
| [Evaluate with Riparian Reserves, include as needed] | | |
| Ecological Corridors | SS 5 | — |
| [Evaluate with Riparian Reserves and other reserved lands for connectivity] | | |

[1] LSRs include significant old-growth 1 and 2 within marbled murrelet Zone 1.

Forest management was modeled using a range of rotation ages, with one or two planned intermediate harvests, to achieve and maintain relative historical acreage levels in each respective seral or successional stage (shrub/sapling; pole/young sawtimber; early-mature, mid-mature; late-mature and old-growth). The Forest was divided into three zones, based on forest type and fire cycles, to model management's effects on forest development and recovery. The north zone, the Forest north and west of the Klamath River (Smith

River NRA and the northwest part of Orleans district), was modeled using a 240 year rotation. The south zone (Mad River district), which is predominantly the Pacific Douglas-fir vegetation series with a dry fire regime, was modeled using a 120 year rotation. The middle zone (southeast portion of Orleans district and the Lower Trinity district) represents the tan oak/ mixed evergreen vegetation series, has a more intermediate fire regime, and was modeled using a 180 year rotation.

The modeling simulation also includes a disturbance correction, based on the assumption that fire suppression and fuels treatments would be partially effective and would lead to a disturbance rotation that would be longer than predicted presettlement zone averages (see FSEIS, 1994, page 3&4-42). Under this assumption, a higher percentage of each LSR and other reserved lands would eventually be covered by forests older than 80 years (Appendix B).

## Direct Effects:

This alternative proposes an "active adaptive" management strategy (Thomas et al., 1990, see Appendix R) that would create and maintain a mosaic of age classes within a multi-storied closed canopy forest. This environment is expected to maintain biological diversity while providing commodity resources from most of the timber-suited land in the Forest matrix. This alternative would contribute to the maintenance of viable populations of currently listed threatened and endangered wildlife species and would be expected to provide sufficient functional suitable habitat to contribute to the viability of all Forest sensitive species that are dependent on mature and late-successional forests.

The PRF alternative, which is consistent with the FSEIS ROD, would protect large contiguous areas of mature and old-growth forest habitat that occur in reserves; northern spotted owl and marbled murrelet CHUs, unmapped LSRs associated with occupied marbled murrelet sites, and the 100 acres designated at activity centers for the spotted owl (FSEIS ROD, 1994). Significant old-growth forest parcels, identified as OG 1 and 2 (Johnson et al., 1991) that occur within the marbled murrelet Zone 1 (Near Zone) were added to the existing LSRs or other large reserves (such as Wilderness). Some NSO critical habitat occurs in the matrix as a result of boundary corrections to coincide with topographic features, such as watershed divisions, or adjustments made by the FSEIS Team to provide protection for all species, including stocks at risk. Large riparian reserves provide one to two site-potential tree heights in width as buffers, of which 43 percent occurs within the matrix and AMA. These riparian reserves leave small slivers of forest that are relatively unmanageable (43 percent of the matrix and AMA), and the Forest estimates an additional 7 percent of the matrix and AMA would likely become inoperable. Protection buffers identified for other selected species would be established during the "survey and manage" stage of project development and would be consistent with the standards and guidelines (FSEIS ROD, 1994).

Silvicultural strategy 5 would regenerate some early- or mid-mature stands that exceeded the recommended management range (based on HRV of each vegetation series by watershed) and poorly stocked stands with green tree retention. It would selectively harvest (thin/ individual tree selection (ITS)) young and mature stands that are well stocked to develop multi-storied mature forest conditions to provide moderate capability habitat for all late-successional wildlife species.

The PRF alternative bases the amount of harvest on the "timber suited" portion of the Forest land base that occurs only in the Forest matrix or AMA. It would regenerate an estimated 4,100 acres per decade; it would selectively intermediate harvest (thin) up to 4,000 and 2,000 acres per decade in early- and mid-mature stands, respectively. Lands selectively harvested under silvicultural strategy 5, with extended harvest rotations based on the historic range of variability, should provide additional mature closed canopy forest that is managed to maintain functional habitat conditions (structure and processes). Thinnings could occur in LSRs, consistent with direction in the FSEIS ROD; however, any volume realized from these thinnings is not expected to contribute to the Forest's allowable sale quantity (ASQ). With most of the Forest in reserved status, more young forest would grow into mature age classes than is scheduled for timber management or prescribed burning.

Options would be maintained to redesign habitat areas or to allocate additional suitable habitat for newly listed wildlife species during the first decade. Forest standards and guidelines require that site specific management plans be developed for occupied bald eagle and peregrine falcon territories before harvesting timber in Special Habitat Management Areas

(consistent with direction in the Recovery Plans). LSRs would be managed consistent with their standards and guidelines and with an assessment that addresses items 1-8 (FSEIS ROD, 1994, S&Gs, page C-11). An assessment of each LSR, as required by the FSEIS ROD, would identify which lands could be managed under silvicultural strategy 5, consistent with each species' respective habitat capability model (Appendix B tables), to achieve the desired future condition or enhanced capability for each area. The assessments would also identify those lands that are currently providing moderate or high quality habitat.

Increased intermediate harvest activity could occur throughout the matrix in later decades. The amount of early successional forest might decline through the first two decades, as existing plantations mature into young pole stands, and then would tend to level off within its respective HRV (see Table III-18; varies by vegetation/fire zone). Large catastrophic fires would continue to create periodic contributions to this age class.

Management of late-successional sensitive species habitat that extends outside reserved lands and CHUs could reduce or, in the short-term, degrade potentially suitable habitat. The Forest predicted, for modeling purposes, that vigorous young and mature stands that were thinned would be degraded and remain unsuitable for an average of 15 years. After 15 years these managed stands would regain their closed canopy condition and, with the snag and down woody material left by standards and guidelines, would become "functionally suitable" wildlife habitat. Young stands could become functionally suitable at 80 years; and, with a 60 year re-entry cycle, competition-induced mortality would be likely to provide additional snag and down log recruitment between each entry.

Some territories that occur in the Forest matrix could be eliminated or vacated after the first decade as breeding individuals are displaced. Occupied territories would be vulnerable Forest-wide to disturbance from dispersed and generally uncontrolled recreation use. Ingrowth from younger stands would occur Forest-wide, increasing the quantity and quality of mature forest conditions within reserved forested lands (LSRs, NSO CHUs, and designated habitat areas). Old-growth stands that occur within these set-aside lands and other unsuited lands would eventually (300-500 years) decline as the conifer component is partially replaced by hardwoods. Figure IV-12 shows that the mature forest strata acreages would increase to over 400,000 acres during the next 5+ decades depending on the occurrence and magnitude of large catastrophic fires. As part of this increase, closed canopy forest acreages are expected to increase while open canopied forest acreages decline, especially within the matrix. Increased intermediate harvest activity could occur throughout the forest in later decades. The amount of early successional forest would decline through the first 2 decades, as existing plantations mature into young pole stands, and then would tend to level off at about the level that currently exists; however, this is dependent on the occurrence of occasional large fires (Figure IV-17). Refer to Table IV-7 for a summary display of management strategies, populations, and some effects on the following species and assemblages under the PRF alternative.

**Threatened and endangered species:**

**Bald eagle:** Adoption of the preferred alternative would have no effect on habitat used by bald eagles for nesting. Forest management around occupied sites would continue to follow the provisions of the Bald Eagle Recovery Plan (USDI, 1986) and the protection afforded under the Special Habitat Management Area. These areas are likely to shift over time, either as individual birds die or following disturbances that could eliminate the nest tree or key roosts. LSRs and riparian reserves would provide additional opportunities for nesting, roosting, and foraging habitat for bald eagles. The designated habitat areas (territories) are designed to provide suitable habitat acreages in conjunction with Regional Recovery Plan targets. Habitat and nest sites within these management zones would be managed at high to moderate levels of habitat capability, as defined in the bald eagle habitat capability model for the Forest. Site specific territory management plans would be prepared, as called for in the Recovery Plan.

Primary disturbance and feeding zones would be managed to benefit or at least not adversely affect active bald eagles. This silvicultural strategy, especially the legacy, would maintain a multi-storied stand structure, with large predominates for nesting and roosting, that is generally preferred by the bald eagle when it occurs in potentially suitable habitat in the vicinity of large rivers or lakes (Appendix B, Table 1). All projects with the potential to affect bald eagles are analyzed to determine their effects on habitat capability within the designated zones. Habitat areas would be modified to accommodate new nest sites.

**Peregrine falcon:** Adoption of the preferred alternative would have no effect on cliff habitat used by peregrines for nesting. Forest management around cliffs would continue to follow the provisions of the Peregrine Falcon Recovery Plan and would offer the protection afforded under the Special Habitat Management Area. Riparian reserves would likely benefit peregrine falcons with a long-term improvement in the prey base population as passerine (typically, perching birds) populations respond to improved habitat conditions. This alternative has 14 designated habitat areas (at active and suspected territories) for the peregrine falcon; each contains a nest site protection zone (Special Habitat MA).

Primary disturbance and feeding zones would be managed to benefit or at least not adversely affect the falcon. This alternative would maintain a multi-storied forest stand structure, with near natural levels of snags, which is generally preferred by many of the falcon's prey species. The Recovery Plan goal of seven breeding pairs could be achieved within one or two decades. Habitat within the feeding zones would be managed at high to moderate levels of habitat capability, as defined in the peregrine falcon habitat capability model for the Forest (See Appendix B, Table 11, maintaining a minimum of 50 percent of the total area in greater than pole size trees), and would fall within the HRV the Forest would be managing for forest-wide. All projects with the potential to affect peregrine falcon would be analyzed to determine their effects on habitat capability within the designated zones. Habitat areas would be modified to accommodate new nest sites.

**Spotted owl:** The preferred alternative proposes to manage suitable habitat and therefore may affect spotted owls that utilize habitat in the forest matrix and AMA for breeding, feeding, or dispersal. While most critical habitat occurs in LSRs, management within critical habitat that occurs in the matrix or AMA would be evaluated through watershed analysis and done in consultation with the USFWS. We expect that the LSRs designated by the FSEIS ROD (1994, Appendix G-Part 3, page G-43) could eventually replace currently designated critical habitat (USDI, 1992).

While the Addendum to the Biological Assessment (BA) for the FSEIS addressed several modifications to Alternative 9, the northern California Forests have replaced the 180 year rotation with rotations that represent their natural disturbance (primarily fire) regimes. The FEMAT panel expected that the implementation of larger riparian reserves (Riparian Reserve Scenario 1 in the FSEIS) and the protection of 100 acres at each activity center in the matrix or AMA would provide additional suitable habitat for dispersal.

The Forest matrix (outside LSRs, critical habitat, and other reserved lands) would be comprised of a mosaic of vegetation types, with their respective successional stages and management areas. Within the matrix, only timber suited portions would be managed intensively under silvicultural strategy 3 (ITS or group selection modeled using a 300 year rotation) and strategy 5, with extended rotations based on the historic range of variability. Some suitable spotted owl habitat within the Forest matrix would be eliminated by regeneration cuts in strategy 5 and, in the short-term, degraded under strategy 3 and the ITS mark in strategy 5. The extended rotations would be expected to provide mature closed canopy forest in the future and to facilitate dispersal in relative quantities greater than that provided under the 50-11-40 Rule (Thomas et al., 1990). The ITS prescriptions under strategies 3 and 5 would, in the short-term (for an estimated 10 to 20 years), degrade mature closed canopy forests. Generally, the first ITS harvest would occur in 50 to 80 year old stands, to start the stand differentiation process and accelerate the stand towards achieving the desired mature forest characteristics. Natural disturbances (fire, wind, and disease) are expected to have a greater effect on the reserved lands because they are so extensive, and the matrix often occurs as inclusions within some reserved lands and other management areas.

The PRF alternative would manage the AMA and matrix to contribute functional mature and late-successional forest habitat in quantities that approximate presettlement levels. From a watershed perspective, the matrix and AMA, with their mosaic of management areas under the different strategies and the extensive array of reserved lands, including the 100-acre activity center cores, would be likely to support some owl pairs. (See addendum to BA: FSEIS Appendix G, Part 3, page G-25). Based on the assumption that the Forest matrix would continue to support some breeding owl pairs, this strategy would help the Forest determine which silvicultural prescriptions benefit the owl and associated late-successional species. Monitoring management activities in the Forest matrix [including AMAs] would determine which activities are beneficial and

which activities have an adverse effect. Research could determine whether thinning early- and mid-mature stands is important to the development of healthy mature forest conditions, and to what extent marginally suitable stands would require silvicultural management if they are expected to provide functionally suitable habitat.

This alternative could result in a reduction of suitable habitat within the matrix and AMA; however, maturation of young stands is expected to exceed proposed regeneration harvest levels and could compensate for some of the short term habitat degradation that results from thinnings. Suitable habitat (including marginally suitable habitat that is primarily poorly stocked, open canopied forest stands) would decrease in the Forest matrix during the first decades. Suitable habitat would increase Forest-wide, since the decreases within the Forest matrix would be compensated for by young timber stands throughout the Forest reaching maturity during this period. The quality of habitat should also increase as open canopied and poorly stocked stands are replaced with younger vigorous stands that have near natural levels of snags and coarse woody debris. The acreage of maturing young stands is expected to be greater than the acres regenerated, thinned, or burned under prescription. Thinnings could degrade a greater amount of potentially suitable acres, since it appears that the Six Rivers NF currently supports more extensive young and mid-mature forests than the data shows occurred during presettlement times. Effects on spotted owls in the Forest matrix from elimination or degradation of suitable habitat would be less than under other alternatives because fewer acres would be treated. The amount of late successional habitat in reserves is greater than other alternatives, which in turn should contribute to the support of owls that occur in the matrix adjacent to the large LSRs.

The increase in acreage of late successional habitat and the reduced amount of suitable habitat lost through timber harvest would provide protection for more occupied spotted owl sites and suitable habitat. Most owls would be maintained, but some owls within the Forest matrix would be adversely affected. We expect research to demonstrate that thinning young stands is important to the development of healthy mature forest conditions, and that marginally suitable stands will require some timber management if they are expected to provide functionally suitable habitat and contribute to moderate or high capability territories within the LSRs. The Biological Opinion (1-1-94-F-03) for the northern spotted owl FSEIS (USDA & USDI, 1994) concluded that Alternative 9 would accomplish or exceed the standards expected for the Federal contribution to recovery of the NSO and would assure adequate habitat for reproduction and dispersal. Implementation of Riparian Reserve Scenario 1 from the FSEIS, which retains more suitable habitat along intermittent streams, and the protection of 100 acres at activity centers outside LSRs would be expected to compensate, in part, for dropping the 50-11-40 rule.

This alternative would result in an increase in suitable spotted owl habitat. Suitable habitat would increase 30 percent in the Forest matrix during the first 5 decades and 13 percent Forest-wide (see Figure IV-12). Increases Forest-wide would be gradual, since the decreases that result from fires and timber management would be more than compensated for by young timber stands throughout the Forest reaching maturity during this period. Marginally suitable habitat, both poorly stocked and open canopied forest stands, would be expected to decline in the Forest matrix over the next 5 decades.

Effects on spotted owls in the Forest matrix from elimination or degradation of suitable habitat would be less than under the other alternatives because fewer acres would be treated and eliminated, and rotations would be longer than under the CUR and MKT alternatives.

The expected increase in suitable habitat indicates that owls would be supported at stable or increasing population levels. Most owls would be maintained, but some owls within the Forest matrix would be adversely affected. The northern spotted owl FSEIS (USDA & USDI, 1994) shows there is a high likelihood that population viability would be maintained by protecting all suitable habitat within the late-successional reserves and CHUs and maintaining dispersal habitat.

This alternative would be expected to compare to others as follows:

Suitable habitat in the Forest matrix would increase over five decades at a higher rate than under all alternatives; higher quality closed canopy forest conditions would increase Forest-wide (Figure IV-13).

Maintain more closed canopy forest conditions within the Forest matrix than all other alternatives.

**Marbled murrelet:** The extensive LSRs that were expanded to include significant old-growth (OG 1 & 2) within Zone 1, would protect most of the existing mature closed canopy forest that occurs on National Forest System land in that zone. The potential to adversely affect suitable murrelet habitat continues to exist between proposed harvest activities and maintaining existing levels of marbled murrelet habitat capability within the Forest matrix. This alternative incorporates guidelines to protect occupied nesting habitat that occurs in the Forest matrix (including the AMA) and would require surveys, to protocol, and consultation prior to any activities that would alter suitable habitat. It would also protect all redwood forest habitat, which occurs in Zone 1. The addition of approximately 77,900 acres of OG 1 & 2 in the Marbled Murrelet Zone 1 to the late-successional reserve system, and the implementation of Riparian Reserve Scenario 1 from the FSEIS would protect most (96 percent) of the suitable habitat in Zone 1.

Silvicultural strategy 5, under extended rotations that maintain the different successional stages within their respective HRV, and would provide for green tree retention of potentially suitable nest trees. It also should maintain some suitable murrelet habitat. Mature and late-successional forests within Zone 1 would increase within the Forest matrix as young stands grow into mid-mature habitat at a greater rate than planned harvest activities could affect it. Mid-mature, late-mature, and old-growth forests within Zone 1 (Near Zone) would increase 21 percent over the next 5 decades as plantations grow into mid-mature habitat (Figure IV-14). Suitable habitat would increase by 14 percent forest-wide by the fifth decade. While some suitable habitat within Zone 1 would be harvested during the planning horizon (5 decades), all occupied suitable habitat would be protected. Some existing early- and mid-mature habitat contains older predominate trees, but existing plantations that grow into mid-mature would generally lack this older component and not provide suitable murrelet habitat until they had reached late-mature stage. This loss of suitable habitat within the Forest matrix could adversely affect active or potential nest stands, movement, and dispersal, and could eliminate future options for management for the murrelet once the USFWS determines critical habitat and recovery needs. Critical habitat for the murrelet would likely require the protection of additional land within the forest matrix (unmapped LSRs for occupied marbled murrelet sites) and the OG 1 & 2 additions within Zone 1 which are not currently designated as critical habitat.

The modifications made to Alternative 9 between draft and final, and the mitigations adopted by the FSEIS-ROD, provide a higher likelihood (84 to 92 percent) of maintaining adequate habitat for the murrelet. The incorporation of marbled murrelet guidelines would meet or exceed the recommendations of the Marbled Murrelet Working Group (FEMAT, 1993). The Biological Opinion (1-1-94-F-03) concluded that Alternative 9 would provide adequate habitat for reproduction and dispersal and the Forests would contribute to the murrelet's recovery. While the Forest realizes that recovery of the marbled murrelet would need to address non-federal lands and ocean fishing, the Forest would continue to work closely with neighboring landowners to survey for and protect occupied murrelet habitat.

**Forest Service sensitive species:**

**Pacific fisher:** Functional habitat would gradually increase in the Forest matrix over the next 5 decades, and then eventually level off. Suitable habitat forest-wide would gradually increase, from 297,800 to 347,000 acres over the next 5 decades, a net gain of 17 percent (Figure IV-15). Loss or degradation of suitable habitat within designated habitat areas could result in lower reproductive success or displacement from designated habitat. This could be partially offset by ingrowth from younger managed stands within the designated areas. Unoccupied suitable habitat might not be recolonized. Most of the existing suitable habitat within the Forest matrix would be degraded or modified by thinnings; however, recovery to functionally suitable habitat would be expected to occur within 1 to 2 decades.

The SAT (USDA, 1993, page 297-298) and FEMAT (USDA & USDI, 1993, pages IV-170-175) reports were reviewed; and, following discussions with local research scientists, it was determined that sufficient suitable fisher habitat would be maintained under this alternative in the reserved lands; and there was a high likelihood that the Forest would contribute to maintaining a viable population. The management of the Pilot fisher habitat area within the Forest AMA, consistent with PSW's literature review (Appendix B, Table B-13), is expected to provide local data on habitat use and how fisher respond to forest management activities.

**American marten:** Suitable mixed conifer habitat would increase slightly in the Forest matrix over the first 5 decades and 3 percent Forest-wide

(Figure IV-16). Increases Forest-wide would be gradual, since the habitat loss within the Forest matrix would be more than compensated for by young timber stands throughout the Forest reaching maturity during this period. Most of the habitat management that adversely affects the marten would occur outside the large late-successional reserves and designated management areas. The loss or degradation of suitable habitat within designated areas could result in lower reproductive success or displacement. Again, the development of functional two-storied stands and ingrowth from maturing stands might compensate for some loss of suitable habitat. Most suitable habitat within the Forest matrix would be degraded by thinnings; however, it is expected to become functionally suitable habitat after about 15 years. Generally, only sparsely stocked open canopied mixed conifer stands would be regenerated, with legacy retained from the original stand. Unoccupied suitable habitat might not be recolonized.

The SAT (USDA, 1993, page 297-298) and FEMAT (USDA & USDI, 1993, pages IV-170-175) reports were reviewed; and, following discussions with local research scientists, it was determined that generally sufficient suitable marten habitat would be maintained under this alternative in the reserved lands; however, there would be a gap between several large LSRs along South Fork Mountain. Three marten habitat areas were designated as Managed Habitat Management Area to ensure a high likelihood that the Forest would contribute to maintaining a viable population (Appendix B, Table B-14).

**Northern goshawk:** Management of potential nesting and foraging habitat, under silvicultural strategy 5, would degrade potentially suitable habitat for about 15 years. This alternative would also include a standard and guideline that would protect known nest sites and maintain fledgling foraging habitat in the vicinity of occupied nest sites. While the occupied nest core would be likely to change locations through time, the managed replacement habitat should be moderately suitable, and adjacent foraging habitat should provide a mosaic of both young and mature forest. While reserved areas and critical habitat cover most of the forest, and have the potential to support a well distributed population, the protection of known nest sites in the matrix would preclude the elimination of active sites before we have validated the assumption that reserved lands are occupied and breeding pairs are successfully producing young. The 100 acre activity center cores established for the spotted owl generally provide two-storied stand conditions, with hardwood understory that might not support active goshawk network territories.

The SAT (USDA, 1993, page 290) and FEMAT (USDA & USDI, 1993, pages IV-164-170) reports were reviewed; and, following discussions with local goshawk biologists, it was determined that, in general, sufficient suitable goshawk habitat would be maintained under this alternative in the reserved lands. However, there was a concern that recent inventories of historic nest sites indicated widespread displacement or failure on the Klamath and Six Rivers National Forests. The Forest has eliminated administrative withdrawal status, consistent with the FSEIS ROD (1994, Appendix C-3) and has provided interim protection for known nest sites that occur in the matrix or AMA. This direction is consistent for the Klamath Province forests in California, and would ensure a high likelihood that the Forest would contribute to maintaining a viable population.

**Wolverine:** Most of the Forest would be managed as large reserves, which contain a majority of the contiguous late-successional habitat. Potentially suitable mature forest habitat outside the large late-successional reserves, critical habitat, and other reserved lands would decrease; however, the extended rotations used on the timber suited lands should provide functional mature forest conditions near the levels that existed during presettlement times.

The PRF alternative would maintain a system of corridors that would provide connectivity between large set-asides and would facilitate dispersal. This alternative would also decommission roads in sensitive areas. The reduction of suitable habitat in the vicinity of large undisturbed management areas and the adequacy of Riparian Habitat Conservation Areas to facilitate movement and dispersal might have the potential to adversely affect the wolverine.

**Harvest species:**

**Black-tailed deer and Roosevelt elk:** Silvicultural strategy 5 would provide some open early succession vegetation and edge habitat preferred by deer for foraging. This strategy would put greater emphasis on the maintenance of optimal cover that would occur with the two-storied stand condition; it would also manage meadows and grasslands to improve their ecological condition. Management

within the Forest matrix would provide some early successional habitat for foraging. The design, size, and placement of harvest and prescribed burning units, in conjunction with other managed areas that occur within a landscape, would determine whether the project would maintain adequate forage/cover ratios and would be beneficial or detrimental to deer or elk. From a watershed perspective, foraging areas resulting from plantations would be expected to decline initially from current levels for the first 2 to 3 decades, as plantations mature; and might level out near the current acreage as cyclic fires continue to occur (Figure IV-17). Existing deer populations would also be expected to experience localized declines. Plantations (forage areas) would mature within set-aside lands, and deer would be expected to return to presettlement densities, with occasional episodic increases in response to catastrophic events such as fire. Elk would be expected to continue their expansion onto the forest, particularly in the vicinity of harvested areas and areas with extensive natural grasslands.

**Black bear:** This alternative would create and maintain a two-storied forest environment with a mixture of age classes that should maintain existing bear populations. Reserved lands and CHUs would provide large relatively undisturbed refugia. Management of the Forest matrix and occasional fires would provide early successional habitat for foraging. Silvicultural strategy 5 would maintain some functional mature stands and the large down logs used for denning and foraging at 80 to 100 percent of natural levels. Road densities would be reduced by closing or decomissioning roads. The design, size, and placement of harvest units, in conjunction with other managed areas that occur within a watershed, would determine the extent to which the project would be beneficial or detrimental to the black bear. Reduction of foraging habitat within the protected lands and intensive management, including road building, within the Forest matrix might adversely affect the black bear or its habitat. Reduction in open road densities would generally benefit the black bear.

**Management indicator species:**

**Pileated woodpecker:** While silvicultural strategy 5 would retain snags and down logs at 80 to 100 percent of natural levels within the General Forest Management Area, the ROD (1994, Appendix C-42) would allow retention in the matrix at the minimum of 40 percent of potential population levels. From a watershed perspective, the Forest matrix would be expected to maintain some suitable habitat with strategy 5; however, contiguous areas within the matrix of sufficient size and distribution might be limited, and their densities would be likely to decrease as a direct result of the reduction in habitat. Thinned stands would be expected to provide functional two-storied stands that would be suitable when they recover.

**Management indicator species assemblages:**

**Riparian Habitat Conservation Area (RHCA):** The PRF alternative would establish Riparian Habitat Conservation Areas (Riparian Reserves) which would be managed consistent with the FSEIS and ROD (1994) under silvicultural strategy 4. Habitat would recycle naturally, and habitat quality would improve for some forest interior wildlife species. Standards and guidelines would be expected to maintain suitable habitat conditions for most riparian wildlife species. Wildlife species that have area requirements for breeding, feeding, or dispersal that exceed the RHCA buffer widths could be adversely affected or displaced.

**Snag and down woody debris:** Snag and down woody debris components should be maintained at or above the 80 percent retention level Forest-wide, including the matrix and AMA. These special habitat components will eventually be managed within the HRV of each forest type (see Table III-18), and evaluated based on site potential, successional stage, and associated risks. The FSEIS ROD (1994, Appendix C, pages 40-42) provides specific direction for coarse woody debris, green tree, and snag retention in the matrix that would be expected to maintain habitat quality for cavity-dependent wildlife species over time. This level of snag and down log retention would be expected to maintain suitable habitat conditions through the extended rotation for most snag dependent wildlife species and those species that require down woody material. Wildfire and, to some extent, prescribed burns are likely to consume snags and down woody debris, while at the same time creating snags and down logs. The timber harvest associated with silvicultural strategy 5 could displace existing individuals; however, the habitat would be expected to become recolonized as the multi-storied closed canopy stand condition is achieved.

**Biological diversity:**

**Habitat diversity and fragmentation:** The overall effect from harvest of old-growth forests under this alternative would be reduction in size of mature and old-growth stands throughout the Forest matrix, with some local increases in fragmentation. Habitat diversity within the Forest matrix might be reduced; however, the matrix in many areas would become an inclusion within reserved lands which might compensate. These effects could endure at least 200 to 300 years before harvested areas would contain the structural characteristics and the habitat function of the original old-growth forest ecosystem. However, this alternative would use silvicultural systems that maintain old-growth structural components (green tree retention, snags, and down woody material) and would likely shorten the time to mature forest conditions to 80 to 120 years. Harvest could reduce interior forest habitat (those areas not influenced by deleterious edge effects) throughout the Forest matrix. The location of harvest units would affect habitat diversity and maintenance of old-growth forest wildlife habitat. This alternative has standards and guidelines for locating harvest units in a manner that would reduce fragmentation as much as possible in a managed setting.

This alternative would identify movement corridors; therefore, fragmentation from a watershed perspective should not increase significantly so long as the management within the corridors does not limit their effectiveness for wildlife that require closed canopy forest conditions.

**Ecological corridors:** This alternative would evaluate up to 6 ecological corridors which would provide connectivity between large late-successional reserves and designated habitat management areas. Management during this planning period would avoid creating barriers to dispersal and ensure connectivity between large contiguous areas of mature forest. These ecological corridors would be managed under silvicultural strategy 5, and the managed two-storied stand condition would be expected to support dispersing wildlife and provide adequate-mature forest conditions for both breeding and foraging. Vacant habitat areas should recolonize faster, and mortality of dispersing individuals should be less for some terrestrial (less mobile) species than under alternatives that would not maintain this connectivity.

## Indirect Effects:

Designated habitat allocations for Managed Habitat Management Areas (outside reserved land, LSRs, and CHUs) could be managed under silvicultural strategy 5 following completion of site specific watershed analyses. Most of the road construction would be expected to occur during the first 2 decades, with up to 50 miles proposed. Should timber management in LSRs and other reserves be permitted in the future, additional miles could be constructed by the fifth decade. The Forest would decommission over 250 miles of road during the planning period, which would compensate for most of the new road construction. Open roads reduce habitat capability for many species of wildlife, and road construction could displace breeding individuals and impede dispersal. The Forest standards and guidelines would provide seasonal restrictions to protect essential occupied territories. Recreational opportunities associated with viewing and hunting wildlife would increase as access to previously unroaded areas is developed.

## Cumulative Effects:

The Forest has coordinated with the State of California and neighboring Federal land managers to work toward the recovery of all Federally listed species, with joint monitoring and survey efforts, shared data, and discussions on maintaining dispersal habitat. Involvement in T&E management on private lands has been primarily to notify the State Department of Fish and Game when T&E wildlife species are discovered on adjacent private lands. The Forest will provide leadership to facilitate T&E recovery in the Klamath and North Coast provinces.

**Cumulative effects specific to the spotted owl:** Management of the owl on non-Federal lands is beyond the scope of the Forest Plan; however, the Forest will continue to work closely with neighboring landowners to facilitate surveys, and coordinate with state of California and our neighbors to minimize take. The proposed section 4(d) regulations (Endangered Species Act) would affect only non-Federal lands within the range of the NSO.

Most critical habitat has been included in designated reserves, and includes no non-federal lands. Some designated critical habitat occurs outside reserved lands as a result of mapping corrections that adjusted LSR boundaries to accurately reflect topographic watershed divisions or other topographic

features that would provide a locatable and manageable boundary. The FEMAT team modified the original critical habitat boundaries in several locations, in response to input from the Forest, to overlay key watersheds or more accurately mesh with other reserved management areas. Sufficient suitable habitat occurred in the LSRs to compensate for these adjustments (particularly after adding OG 1 & 2 in marbled murrelet Zone 1).

**Cumulative effects specific to the marbled murrelet:** Management of the murrelet on non-federal land is a major concern in California, where substantial numbers of murrelets and high quality nesting habitat occurs. Murrelets are also vulnerable to entanglement in gill nets and seines.

Again, while the management of the murrelet on non-federal land is beyond the authorities of the Forest service, we will continue to work with the USFWS, state and private landowners to protect occupied murrelet habitat and minimize incidental take. All proposed critical habitat has been designated Reserved, primarily as LSR. The forest has also protected significant old-growth stands (OG 1 and 2) that occur in Zone 1 as LSRs
; these stands are generally adjacent to other reserved lands.

**Cumulative effects to other wildlife species:** The Forest has established a Managed Habitat Area for the American marten and standards and guidelines for candidate and Forest Service Sensitive wildlife species that would protect additional mature and late-successional forest habitat throughout the forest.

The Forest timber strata data currently shows considerable acreage in open canopied forest (less than 40 percent overstory conifer canopy closure). Most sparsely stocked stands that occur in this timber strata generally provide only marginal or low quality habitat, and may eventually require regeneration for the stand to provide functional two-storied, closed canopy forest habitat in a managed condition. Large contiguous areas of mature closed canopy forest should provide for those wildlife species dependent on the mature and old-growth successional stages; however, a portion of this mature habitat would be expected to be comprised of younger forest age classes that have retained a legacy from older stands. While the Forest standards and guidelines would maintain near natural levels of special habitat components (snags, down logs, and hardwoods), monitoring and research would be necessary to determine how well the standards mimic the natural condition. Habitat for those species dependent on earlier successional stages would be likely to decline during the next few decades, particularly within the large reserves, as existing plantations mature into young pole stands. Mature and old-growth forest habitat acreages would continue to increase to over 400,000 acres and would be likely to fluctuate as a result of extensive stand replacing fires beyond the planning horizon (Figure IV-12).

**Short term and long term effects:** The cumulative effects of this project are divided between the short term detrimental and the long term beneficial effects.

The action proposes to treat approximately 1,000 acres of young, mature, and older forest each year, regenerating up to 400 acres/year (with green tree retention) of mature and older forest stands and selectively thinning up to 600 acres/year in young and vigorous mature forest stands. This action also proposes to conduct prescribed burning and other fuel reduction activities on 3,000 acres annually, to reduce the risk of large catastrophic fires eliminating essential suitable habitat.

In the long term, the Forest would expect the thinnings and intermediate prescriptions to maintain desired habitat components, provide functionally suitable habitat within 10 to 20 years, and eventually maintain the successional stages of wildlife habitat at levels approaching historic or presettlement conditions. This strategy would rely on previously thinned young and mature forest stands that have recovered to provide the functional mature two-storied stand conditions within the matrix. The Forest standards and guidelines would provide “green tree retention” of live trees and hardwoods plus a legacy of snags and down logs from the original stand, which would be expected to provide some old-growth attributes as the stand matures. With a 50 year re-entry period for thinnings, competition-induced mortality would provide additional snags and down logs. Ingrowth from younger stands is likely to exceed the acreage harvested or lost to natural disturbances, such as fire. The Forest expects that mature and older closed canopy forest would increase to the extent we can protect and manage the large reserves to reduce the size of large catastrophic fires. Large fires would be expected to occur periodically.

## OGR Alternative

The OGR alternative would use silvicultural strategies 3, 4, and 5 in the wildlife management areas. These strategies are described in detail in Appendix F. Table IV-10 shows how these strategies would apply to six species and the corridors, and it indicates the number of habitat areas which the strategies would protect.

**Table IV-10.**
**Silvicultural Strategies for Wildlife- OGR**

| Habitat Management Area | Zone and Silvicultural Strategy (SS) | Areas Protected |
|---|---|---|
| **Special Habitat** | | |
| Bald eagle | Nest: SS 4; other: SS 5 | 6 |
| Peregrine falcon | Nest: SS 4; other: SS 5 | 14 |
| Spotted owl | CHU/Cat. 1&2 HCAs: SS 4 | 8 |
| | Category 4 HCAs: SS 4 | 47 |
| **Managed Habitat** | | |
| Northern goshawk | Nest: SS 4; other: SS 5 | 56 |
| Pacific fisher | SS 5 | 18 |
| American marten | SS 5 | 33 |
| Wildlife Travel Corridors | SS 5 | — |
| Ecological Corridors | SS 5 | 10 |

## Direct Effects:

This alternative proposes an active adaptive management strategy that would protect old-growth reserves 1 (most significant) and 2 (significant), and would be similar to the more conservative proposals developed by the Scientific Panel on Late-successional Forests (Johnson et al., 1992). This alternative would be expected to contribute to the recovery of currently listed threatened and endangered wildlife species, and would have a high likelihood of providing sufficient suitable habitat to ensure the Forest would contribute to the viability of all Forest sensitive species that are dependent on mature or old-growth forests. This alternative would protect large contiguous areas of mature and old-growth forest habitat that would recycle naturally over time. The management of Pacific fisher, American marten, and northern goshawk habitat management areas that extend outside reserved lands, NSO CHUs, and old-growth reserves 1 and 2 would reduce or, in the short-term, degrade potentially suitable habitat.

The OGR alternative would initially regenerate up to 7,800 acres per decade; that rate would decline when plantations are old enough for thinning to compensate for the decreased rate of regeneration. This alternative would intermediate harvest 500 acres per decade initially and later, as plantations mature, about 4,000 acres per decade. Lands selectively harvested under silvicultural strategy 5, with extended harvest rotations of 180 years, would maintain additional mature closed canopy forest in a managed condition, with a 15 year average recovery period.

Some options would be maintained to redesign habitat areas or to allocate additional suitable habitat to accommodate newly listed species or to meet changing research findings during the first decade. Some territories that occur in the Forest matrix would be eliminated or vacated as breeding individuals are displaced after the first decade. Ingrowth from younger stands would occur forest-wide, increasing the quantity and quality of mature forest conditions within Categories 1 and 2 HCAs, NSO CHUs, and reserved old-growth areas. Old-growth stands that occur within these set-aside lands and other unsuited lands would eventually decline (300-500 years) as the conifer component is partially replaced by hardwoods. Figures IV-13 and IV-14 show the slight decrease in the mature forest habitat strata over time, with the smallest changes occurring in the closed canopy (>40 percent) mature forest. The amount of early successional forest would decline rapidly for the first 3 decades, as existing plantations mature into young pole stands, and then level off at about 88 percent of what currently exists (Figure IV-17). Refer to Table IV-7 for a display of management strategies, populations, and some effects on the following species and assemblages under the OGR alternative.

**Threatened and endangered species:**

**Bald eagle:** Effects would be the same as in the PRF alternative.

**Peregrine falcon:** Effects would be the same as in the PRF alternative.

**Spotted owl:** Management would be the same as in PRF, except that old-growth reserves 1 and 2 would be managed under silvicultural strategy 4, and the timber suited portions of the Forest matrix would be managed under strategy 3 (ITS and group selection under 300 year rotation) and strategy 5 with a 180 year rotation, on a reduced land base.

Suitable spotted owl habitat within the Forest matrix would be eliminated by regeneration cuts in strategy 5 and degraded in the short-term under strategy 3 and the ITS mark in strategy 5. Managed stands under extended rotations of 180 years would be expected to provide mature closed canopy forest in the future. From a landscape perspective, the mosaic of management areas under the different silvicultural strategies would be likely to maintain some owl pairs.

Suitable habitat would decrease 31 percent in the Forest matrix in the first 5 decades, but would increase 1 percent Forest-wide (Figure IV-12). The decrease Forest-wide would be less because younger stands throughout the Forest would reach maturity.

More known and historic pairs and territorial single owls would be protected (see Table IV-7) and more pairs could be expected to occupy CHUs.

Effects on spotted owls in the Forest matrix from elimination or degradation of suitable habitat would be similar to those under the PRF alternative; slightly less habitat would be eliminated and more pairs would be protected Forest-wide and expected to occupy CHUs.

The northern spotted owl EIS (USDA, 1992) shows there is a high likelihood that population viability would be maintained by protecting all suitable habitat within the HCAs, NSO CHUs, and old-growth reserves 1 and 2.

This alternative would be expected to compare to others as follows:

Suitable habitat in the Forest matrix would decline at a greater rate than under CUR, but fewer owl pairs would be adversely affected because the Forest matrix would be half the size.

This alternative, after the PRF and ECR alternatives, would provide for the second-greatest number of owl pairs Forest-wide.

**Marbled murrelet:** This alternative would incorporate guidelines to protect occupied nesting habitat that occurs in the Forest matrix. Silvicultural strategy 5, under an extended rotation, would retain a legacy of potentially suitable nest trees. While it would maintain the most potentially suitable murrelet habitat, it is likely that additional occupied habitat could occur outside the old growth reserves. The murrelet requires large limbs that are protected by the closed canopy of mature and old-growth forests for nesting. Mid-mature, mature, and old-growth coniferous forests within 35 miles of the coast would remain near current levels Forest-wide and decrease by 17 percent within the Forest matrix during the first few decades, and then increase as younger stands mature (Figure IV-14). This alternative would protect more suitable habitat than the CUR and MKT alternatives and would leave a number of options for future management. Critical habitat for the murrelet would be likely to require the protection of some land within the Forest matrix.

The Scientific panel (Johnson et al., 1991) indicated there was a high likelihood that sufficient suitable murrelet habitat would be maintained under this alternative. The incorporation of marbled murrelet guidelines would increase that likelihood, and the alternative would be likely to ensure that the Forest would contribute to the murrelet's recovery.

**Forest Service sensitive species:**

**Pacific fisher:** Suitable habitat would decrease 21 percent in the Forest matrix in the first 5 decades; suitable habitat Forest-wide would increase slightly during the first 2 decades and then increase 10 percent by the fifth decade (Figure IV-15). The increase Forest-wide would occur primarily in categories 1 and 2 HCAs, old-growth reserves, and CHUs as pole stands mature.

The Scientific panel (Johnson et al., 1991) indicated there was a high likelihood that sufficient suitable fisher habitat would be maintained under this alternative; the incorporation of fisher habitat management areas within the old-growth reserves would be consistent with PSW's literature review (Freel, 1992) and would further increase the likelihood of ensuring that the Forest would contribute maintaining a viable population.

**American marten:** Suitable habitat would decrease 40 percent in the Forest matrix during the first 5 decades, and 3 percent forest-wide (Figure IV-16). The decrease in the Forest matrix would generally be compensated for by increases that occur primarily in categories 1 and 2 HCAs, old-growth reserves, and NSO CHUs as pole stands mature. Under this alternative there would be little mixed conifer forest remaining within the Forest matrix. There would be some loss or degradation of suitable habitat, which might result in disturbance or

displacement. The additional suitable habitat that would occur within the old-growth reserves should compensate for designated habitat that would occur in the Forest matrix. Unoccupied suitable habitat might not be recolonized.

The Scientific panel (Johnson et al., 1991) indicated there was a high likelihood that sufficient suitable marten habitat would be maintained under this alternative, and it would be likely to ensure that the Forest would contribute to maintaining a viable population.

**Northern goshawk:** Sixteen of the 24 habitat areas that would occur outside categories 1 and 2 HCAs and NSO CHUs would be available for timber harvest. Replacement nesting habitat, managed under silvicultural strategy 5 (ITS), would degrade potentially suitable habitat for about 15 years. This alternative also includes a standard and guideline that would maintain fledgling foraging habitat in the vicinity of occupied nest sites. While the occupied nest core would be expected to change through time, the managed replacement habitat provided by strategy 5 should be moderately suitable (following the functional recovery period), and adjacent foraging habitat should provide a mosaic of both young and mature forest. The OGR alternative would provide a well distributed array of suitable habitat for the goshawk; however, it might not maintain active goshawk territories within the Forest matrix.

**Wolverine:** The effects of this alternative would be very similar to those for PRF.

**Harvest species:**

**Black-tailed deer and Roosevelt elk:** The management for deer and elk is similar to PRF, with less land being treated and a smaller land base. Silvicultural strategy 5 would provide some open early succession vegetation and edge habitat preferred by deer for foraging (Figure IV-17). This silvicultural strategy would put greater emphasis on the protection and maintenance of optimal cover maintained within the old-growth reserves and by the two-storied forest condition. From a landscape perspective, foraging areas resulting from plantations would be expected to decline rapidly from current levels for 3 decades, and then gradually decline to about 25 percent of the current acreage. Existing deer populations would also be expected to decline. Plantations currently providing forage would mature within old-growth reserves, and deer densities would be expected to return to historic levels, with occasional episodic increases in response to catastrophic fires.

**Black bear:** This alternative is similar to PRF, and would maintain large forested refugia in reserved lands and old-growth reserves. Management of the reduced Forest matrix and wildfire would provide some early successional habitat for foraging. Silvicultural strategy 5 (ITS) would be expected to maintain functional mature stands and the large down logs used for denning and foraging at the 80 to 100 percent level. The design and placement of harvest units, in conjunction with other managed areas and roads that occur within a landscape, would determine the extent to which the project is beneficial or detrimental. This alternative would construct few roads and reduce open road densities, which would generally benefit the black bear.

**Management indicator species:**

**Pileated woodpecker:** Effects would be the same as for PRF.

**Management indicator species assemblages:**

**Riparian Management Area (RMA):** Effects would be the same as for PRF.

**Snag and down woody debris:** Effects would be the same as for PRF.

**Biological diversity:**

**Habitat diversity and fragmentation:** Effects would be similar to PRF, but it would take 80-120 years for the regenerated stand to provide the habitat function of the original mature forest ecosystem.

**Ecological corridors:** This alternative includes 10 ecological corridors to provide connectivity between reserved lands and the old-growth reserves 1 and 2, similar to PRF. These ecological corridors would be managed under silvicultural strategy 5. As managed habitat matures, corridors would change over the landscape in subsequent decades to avoid creating barriers to dispersal, and to be wide enough for colonization by dispersing wildlife species.

## Indirect Effects:

Designated habitat allocations for both Wildlife Habitat Management Areas (outside reserved land, categories 1 and 2 HCAs, and NSO CHUs) would occur primarily within the old-growth reserves. Most of the road construction would be expected to occur during the first 2 decades, with 23 miles proposed for the first decade and an additional 88 miles by the fifth decade. The Forest would decommission about 300 miles of road during this period, which should compensate for most of the new road construction. Open roads reduce habitat capability for many species of wildlife, and road construction could displace breeding individuals. The Forest standards and guidelines provide seasonal restrictions to protect essential occupied territories. Recreational opportunities associated with viewing and hunting wildlife would increase as access to previously unroaded areas is developed. The increasing open road densities within the Forest matrix would result in disturbance to some wildlife and could displace species sensitive to disturbance.

## Cumulative Effects:

The intermediate harvest (ITS) and regeneration at extended rotations implemented on areas managed for timber under silvicultural strategy 5 would provide a mosaic of all age classes of forest habitat within the Forest matrix. The large contiguous areas of mature and old-growth forests would provide for those wildlife species dependent on the mature and old-growth successional stages. Habitat for those species dependent on earlier successional stages would decline during the next 3 decades, particularly within the set-aside lands, as existing plantations mature into young pole stands. Mature forest habitat would gradually increase, as ingrowth from younger stands begins to exceed the acres harvested, and selectively harvested areas begin to provide functional habitat. Competition induced mortality would provide snags and down logs.

## MKT Alternative

The MKT alternative would use silvicultural strategies 1, 2, 3, and 4 in the wildlife management areas. These strategies are described in detail in Appendix F. Table IV-11 shows how these strategies would apply to six species and the corridors, and it indicates the number of habitat areas which the strategies would protect.

**Table IV-11.**
**Silvicultural Strategies for Wildlife - MKT**

| Habitat Management Area | Zone and Silvicultural Strategy (SS) | Areas Protected |
|---|---|---|
| **Special Habitat** | | |
| Bald eagle | Nest: SS 4; other: SS 2 | 6 |
| Peregrine falcon | Nest: SS 4; other: SS 2 | 8 |
| Spotted owl | CHU/Cat. 1&2 HCAs: SS 4 | 8 |
| | Category 4HCAs: SS 4 | 91 |
| Pacific fisher | SS 4 | 14 |
| American marten | SS 4 | 20 |
| **Managed Habitat** | | |
| Spotted owl | CHU add on: SS 3 | 3 |
| Northern goshawk | Nest: SS 3; other: SS 2 | 56 |
| Pacific fisher | SS 1 | None |
| American marten | SS 1 | None |
| Wildlife Travel Corridors | SS 2 | — |
| Ecological Corridors | — | None |

## Direct Effects:

This alternative would continue the past management strategy which has resulted in the Forest's current condition. This alternative would be expected to contribute to the recovery of the Federally listed bald eagle and peregrine falcon. It would adopt the passive adaptive management strategy for the spotted owl, which relies solely on the large categories 1 and 2 HCAs (including the 50-11-40 rule) to maintain viable populations of the spotted owl. It has a low likelihood of maintaining sufficient suitable habitat to ensure it would contribute to the viability of the marbled murrelet or other Forest sensitive species that are dependent on late-successional forests (Johnson et al., 1991). Management of Pacific fisher, American marten, and northern goshawk habitat that occurs outside reserved lands and categories 1 and 2 HCAs is likely to displace breeding individuals over time, resulting in subpopulations that would be isolated and reduced below threshold levels.

The MKT alternative would regenerate, on average, over 21,000 acres per decade and intermediate harvest, on average, over 14,000 acres starting in decade 3. Lands regenerated under silvicultural strategy 1, with harvest rotations of 100 years, would no longer provide mature closed canopy forest conditions. Lands regenerated under strategy 2 with 120-140 year rotation would provide some young and mid-mature closed canopy forest, and mature stands on lands unsuitable for timber production (strategy 4) would continue to mature into old-growth that would eventually (300-500 years) decline as the conifer component is partially replaced by hardwoods or consumed by fire. Silvicultural strategy 3 is a selective harvest strategy that would generally maintain some mature forest conditions over a 300 year rotation period.

Some options would be maintained to redesign habitat management areas or to allocate additional suitable habitat to meet changing needs or research findings during the first decade. Some essential territories would be eliminated or the individuals displaced, and some opportunities to allocate specific habitat areas would be foregone after the first decade. Ingrowth from younger stands would occur forest-wide, which would increase the quantity and quality of mature forest conditions within categories 1 and 2 HCAs and reserved lands. Figures IV-12 and IV-13 show how the mature and old-growth forest acreage (including closed canopy) would decrease Forest-wide as these stands would be regenerated within the Forest matrix and replaced by young forest conditions. Refer to Table IV-7 for a display of management strategies, populations, and some effects on the following species and assemblages under the MKT alternative.

**Threatened and endangered species:**

**Bald eagle:** Primary disturbance and feeding zones would be managed to ensure beneficial or neutral effects to the bald eagle.

**Peregrine falcon:** Primary disturbance and feeding zones would be managed to benefit, or at least not adversely affect, the peregrine falcon. Recovery of the species would be slow, and all newly occupied habitat would require protection, until seven breeding pair were active each year.

**Spotted owl:** Silvicultural strategies in the Forest matrix would be the same as in the CUR alternative, with the same general effects on suitable spotted owl habitat within the Forest matrix. The mosaic of management areas under the different silvicultural strategies would be likely to maintain some owl pairs. The Forest matrix would not be expected to support sufficient breeding owl pairs to permit entries into categories 1 and 2 HCAs in the future.

Suitable habitat would decrease 36 percent in the Forest matrix in the next 5 decades, but would remain near current levels Forest-wide (Figure IV-12). Overall, declines Forest-wide would be less, since the decreases within the Forest matrix would be partially compensated for by young timber stands throughout the Forest reaching maturity during this period. The MKT alternative would result in the greatest reduction of suitable owl habitat within the Forest matrix, regenerating about 25 percent more land than the CUR alternative.

Effects on spotted owls in the Forest matrix from elimination or degradation of suitable habitat would be greater than under the CUR alternative because more acres would be treated and eliminated than under the CUR alternative. There would be 75 percent fewer historic territorial singles in the Forest matrix. The spotted owls could be expected to be displaced when the acreage of suitable habitat remaining would not support breeding owls.

The northern spotted owl EIS (USDA, 1992) shows there is a high likelihood that population viability would be maintained by protecting all suitable habitat within the categories 1 and 2 HCAs and NSO CHUs.

**Marbled murrelet:** There would be a conflict between proposed harvest activities and maintaining existing levels of marbled murrelet habitat capability within the Forest. Young, mature, and old-growth forest within 35 miles of the Pacific coast would remain near current levels Forest-wide but would decrease by 34 percent within the Forest matrix by the fifth decade (Figure IV-14). Habitat would be fragmented. Fragmentation and loss of potentially suitable nesting habitat would be likely to adversely affect the murrelet and could eliminate future options for management for the murrelet once the USFWS determines critical habitat needs. The future identification and designation of critical habitat and recovery plan habitat requirements would be likely to require the protection of additional land in the Forest matrix.

The Scientific panel (Johnson et al., 1991) indicated that similar alternatives would have a low likelihood of maintaining sufficient habitat for the marbled murrelet, and there is a low likelihood that the Forest would contribute to the recovery of the murrelet.

**Forest Service sensitive species:**

**Pacific fisher:** The MKT alternative would protect 14 habitat areas for the Pacific fisher that would provide mature and overmature core breeding habitat ranging from 9,800 to 11,500 acres. These fisher areas primarily overlay the large categories 1 and 2 HCAs and reserved lands. No fisher management areas outside categories 1 and 2 HCAs, or NSO CHUs, would be designated. Effects on fisher habitat would be greater than those in the CUR alternative, leaving gaps between reserved lands and HCAs that exceed the spatial dispersion guidelines.

There would be a lower likelihood that sufficient suitable fisher habitat would be maintained, and there would be a low likelihood that the Forest would contribute to maintaining a viable population.

**American marten:** Twenty habitat management areas for the American marten would provide some mature and old-growth core breeding habitat ranging from 1,400 to 2,500 acres within major reserved lands (Wilderness and Smith River NRA), and partially overlay the large categories 1 and 2 HCAs. There would be no designated marten habitat management areas outside categories 1 and 2 HCAs or other set-asides. Effects on marten habitat would be greater than those in the CUR alternative, with gaps between the HCAs and reserved lands that exceed the dispersal capabilities of the marten. Vacant suitable habitat is likely to remain unoccupied.

The greater decrease in habitat in the Forest matrix and Forest-wide (Table IV-16) indicates there is a low likelihood that sufficient suitable marten habitat would be maintained under this alternative, or that the Forest would contribute to maintenance of a viable population.

**Northern goshawk:** Effects would be very similar to those in the CUR alternative.

**Wolverine:** Effects would be greater than those in the CUR alternative.

**Harvest species:**

**Black-tailed deer and Roosevelt elk:** Silvicultural strategies 1 and 2 would provide the most open early succession vegetation and edge habitat preferred by deer for foraging (Figure IV-17); however the increased livestock use expected would be likely to utilize most of this “transitory” range. These strategies would also put reduced emphasis on the protection and maintenance of thermal or escape cover. The effects on habitat for these species would be generally similar to the CUR alternative, but the greater numbers of acres harvested Forest-wide would result in an increase in forage component, providing about 20 percent more early seral/forage habitat. Local deer populations in the Forest matrix might increase slightly, depending on livestock use permitted. This alternative would provide the greatest acreage in plantations which provide transitory early successional vegetation for deer and elk.

**Black bear:** Effects would be similar to CUR; forested refugia would be smaller in this alternative, and this alternative would construct the most roads, within the Forest matrix.

**Management indicator species:**

**Pileated woodpecker:** Effects would be similar to CUR. Reserved lands and categories 1 and 2 HCAs would be expected to provide sufficient suitable habitat for the woodpecker, and habitat capability of younger stands would be expected to decline due to minimum levels of snag and down wood retention.

**Management indicator species assemblages:**

**Riparian Management Area (RMA):** Effects would be the same as for CUR.

**Snag and down woody debris:** The effects on these components would be similar to those for the CUR alternative, managing these components at minimum or threshold levels, without legacy for future recruitment. The greater number of acres harvested Forest-wide would result in minimal or threshold levels of suitable habitat conditions for most snag dependent wildlife and reduced local population densities throughout the Forest matrix.

**Biological diversity:**

**Habitat diversity and habitat fragmentation:** Effects would be greater than CUR. The duration of effects on structural characteristics and habitat function of the old-growth forest ecosystem could be slightly shorter, but this alternative would be more likely to adversely affect the viability of some species' populations on the Forest.

**Ecological Corridors:** Effects would be similar to CUR.

## Indirect Effects:

The indirect effects would be similar to those for the CUR alternative.

## Cumulative Effects :

The 100 and 120-140 year rotations implemented on areas managed for timber under silvicultural strategies 1 and 2, respectively, would provide a continuous mosaic of young forest habitat for those wildlife species dependent on the earlier successional stages. Habitat Forest-wide for those species dependent on mature or old-growth forest habitat would decline during the next 5 decades, particularly within the Forest matrix. Should new wildlife species be listed, it is likely that additional suitable habitat that occurs in the Forest matrix would be set aside.

## ECR Alternative

The ECR alternative would use silvicultural strategies 4 and 6. These strategies are described in detail in Appendix F. Table IV-12 shows how these strategies would apply to six species and the corridors, and it indicates the number of habitat areas which the strategies would protect.

**Table IV-12.**
**Silvicultural Strategies for Wildlife - ECR**

| Habitat Management Area | Zone and Silvicultural Strategy (SS) | Areas Protected |
|---|---|---|
| **Special Habitat** | | |
| Bald eagle | Nest: SS 4; other: SS 6 | 6 |
| Peregrine falcon | Nest: SS 4; other: SS 6 | 8 |
| Spotted owl | CHU/Cat. 1&2 HCAs: SS 6 | 8 |
| | Category 4 HCAs: SS 6 | 91 |
| **Managed Habitat** | | |
| Northern goshawk | Nest and other: SS 2 | None |
| Pacific fisher | SS 6 | 18 |
| American marten | SS 6 | 40 |
| Wildlife Travel Corridors | SS 6 | NA |
| Ecological Corridors | SS 6 | NA |

## Direct Effects:

This alternative proposes a management strategy that would manage the entire forest an the longest rotation and would maintain mature and old-growth forests at historic levels. This alternative should maintain viable populations of currently listed threatened and endangered wildlife species, and would be expected to provide sufficient suitable habitat to ensure viability of all Forest sensitive species that are dependent on mature or old-growth forests. The primary assumption of this alternative is that it would eventually provide habitat quality and quantities similar to those which occurred naturally, precluding the need for HCAs or designated wildlife areas. This alternative would maintain a forest landscape with large contiguous areas of mature and old-growth forest habitat that would recycle naturally over time. Timber harvest would focus on forest stands that are declining, and the amount of mature forest habitat harvested each decade would mimic natural processes of stand replacement. This alternative would protect categories 1 and 2 HCAs and NSO CHUs until silvicultural

strategy 6, as modified by research and monitoring data, demonstrates conclusively that owl populations are stable and increasing and verifies positive owl response to stands treated under strategy 6.

This alternative would regenerate 4,100 acres per decade and intermediate harvest (thin-ITS) another 1,600 to 3,200 acres. Lands harvested under silvicultural strategy 6, with harvest rotations of 333 years, would maintain additional mature closed canopy forest in a managed condition. Most of the road construction would be expected to occur during the first 2 decades, with 212 miles proposed for the first decade. Assuming the HCAs become available after four decades, an additional 169 miles of road would be constructed by the fifth decade. The Forest would decommission over 300 miles of road during this period, which should compensate for some of the new road construction.

Many options would be maintained to redesign habitat areas or to allocate additional suitable habitat to meet changing needs or new research findings in the first decade. Some territories that occur in the Forest matrix may be eliminated or become vacant as breeding individuals are displaced after the first decade. Ingrowth from younger stands would occur Forest-wide, increasing the quantity and quality of mature and old-growth forest conditions within categories 1 and 2 HCAs, NSO CHUs, and old-growth areas occurring on reserved lands. Old-growth stands that occur within these set-aside lands and other unsuited lands would eventually (300-500 years) decline as the conifer component is partially replaced by hardwoods. Figures IV-12 and IV-13 show the gradual increase in the mature forest habitat strata, with the greatest increases (>40 percent) occurring in the closed canopy mature forest. The amount of early successional forest would decline rapidly for the first 3 decades, as existing plantations mature into young pole stands, and then level off at about 54 percent of what currently exists (Figure IV-17). Refer to Table IV-12 for a display of management strategies, populations, and some effects on the following species and assemblages under the ECR alternative.

**Threatened and endangered species:**

**Bald eagle:** Primary disturbance and feeding zones would be managed to maintain more mature and old-growth forest in a relatively undisturbed condition than the other alternatives, and the longer rotation should provide larger diameter nest and roost trees that could be utilized by the bald eagle when it occurs in potentially suitable habitat in the vicinity of large rivers or lakes.

**Peregrine falcon:** Primary disturbance and feeding zones would be managed to benefit the peregrine falcon. Recovery should be similar to PRF and OGR.

**Spotted owl:** All HCAs and NSO CHUs would eventually be managed under silvicultural strategy 6 to benefit the spotted owl.

Suitable spotted owl habitat within the Forest matrix would be eliminated by regeneration cuts in strategy 6, but at a rate which mimics the natural process of stand replacement: 3 percent regeneration harvest per decade. The 333 year rotation would be expected to provide mature closed canopy forest in the future. From a landscape perspective, the mosaic of management areas under the different silvicultural strategies would be likely to maintain most spotted owl pairs.

Alternative ECR is also based on the assumption that the Forest matrix will support sufficient breeding owl pairs to permit extensive entries into categories 1 and 2 HCAs and CHUs in the future. Monitoring of the Forest matrix must first prove that the assumption is correct before the large HCAs may be entered. We expect research to demonstrate that management at a rate that mimics the natural process of stand replacement would provide sufficient functionally suitable habitat.

A few of the spotted owls that occur in the Forest matrix, including category 4 HCAs, may be adversely affected by the elimination of suitable habitat under silvicultural strategy 6. Overall, however, suitable habitat would increase in the Forest matrix and the owls should benefit. Suitable habitat would increase 12 percent in the Forest matrix during the next 5 decades and 15 percent Forest-wide (Figure IV-12). The increase would be gradual, both in the Forest matrix and Forest-wide; however, the ECR alternative, like the PRF alternative, would provide for the greatest increase in suitable owl habitat of all alternatives, and would likely provide for the greatest number of owl pairs Forest-wide.

The northern spotted owl EIS (USDA, 1992) shows there is a high likelihood that population viability would be maintained by protecting all suitable habitat within the categories 1 and 2 HCAs and NSO CHUs for the planning horizon. The

increase of suitable habitat in the matrix indicates that owls would be supported in stable or increasing population levels in the Forest matrix over the next 5 decades.

**Marbled murrelet:** Mid-mature, mature, and old-growth Douglas-fir forests within 35 miles of the coast would increase by 17 percent Forest-wide, and following slight decreases, increase by 2 percent within the Forest matrix by the fifth decade (Figure IV-14). The decreases should not adversely affect the murrelet, since the desired future condition for this alternative would provide for mature and old-growth forest to comprise 85 percent of the forested landscape. Also, this alternative has standards and guidelines for locating harvest units to reduce fragmentation as much as possible within a managed setting.

While the Scientific panel (Johnson et al., 1991) did not consider this type of alternative, we would expect its effects to be similar to other low intensity alternatives on late-successional wildlife species. Therefore, we assume there is a high likelihood that sufficient suitable murrelet habitat would be protected under the ECR alternative, and that the alternative would ensure that the Forest would contribute to maintaining a viable population.

**Forest Service sensitive species:**

**Pacific fisher:** Designated fisher habitat management areas that occur outside HCAs and proposed CHUs would be managed under silvicultural strategy 6. Suitable habitat would increase 8 percent in the Forest matrix during the first 5 decades and 14 percent Forest-wide (Figure IV-15). Management of suitable habitat within habitat management areas would be similar to alternatives CUR, PRF, and OGR. However, additional suitable habitat would be maintained in the General Forest Management Area. Unoccupied suitable habitat should be recolonized over time.

The Scientific panel (Johnson et al., 1991) did not consider this type of alternative; however, alternatives that would be managed at similar intensities provided a high likelihood that sufficient suitable fisher habitat would be maintained. Therefore, it is assumed that fisher habitat management areas within the Forest matrix, consistent with PSW's literature review, would be accommodated within this silvicultural strategy and would reduce the risk. There is high likelihood that the Forest would contribute to maintaining a viable population.

**American marten:** Designated marten habitat management areas that occur outside HCAs and proposed CHUs would be managed under silvicultural strategy 6. Suitable habitat would increase 3 percent in the Forest matrix and 2 percent Forest-wide during the next 5 decades (Figure IV-16). Management of suitable habitat within habitat management areas is similar to alternatives CUR, PRF, and OGR. However, additional suitable habitat would be maintained in the General Forest Management Area and should compensate for designated habitat that would be managed under strategy 6. Unoccupied suitable habitat should be recolonized over time.

The Scientific panel (Johnson et al., 1991) did not consider this type of alternative; however, we would expect its effects to be similar to alternative OGR for late successional wildlife species. Therefore, we assume there is a high likelihood that sufficient suitable marten habitat would be maintained under this type of alternative, and that marten habitat management areas which occur in the Forest matrix, consistent with PSW's literature review, would be provided for and would further reduce the risk. The ECR alternative would have a high likelihood of maintaining the Forest contribution to population viability.

**Northern goshawk:** Goshawk habitat is not designated under this alternative. The 19 historically occupied sites and newly discovered territories would be protected with the Forest standards and guidelines, with 200 acre nest cores. While the occupied nest cores would be expected to change through time, the managed replacement habitat provided by silvicultural strategy 6 should be moderately or highly suitable, and adjacent foraging habitat should provide a mosaic of all age classes. Silvicultural strategy 6 would be expected to maintain active goshawk territories and potentially suitable habitat throughout the Forest.

**Wolverine:** Potentially suitable mature forest habitat outside reserved areas, categories 1 and 2 HCAs, and NSO CHUs would decrease slightly; however, the 333 year rotation used on the timber suited lands should provide natural mature and old-growth forest conditions.

**Harvest species:**

**Black-tailed deer and Roosevelt elk:** Silvicultural strategy 6 would provide some open early succession vegetation and edge habitat preferred by deer for foraging (Figure IV-17). This and the PRF alternative would regenerate the least acreages and put greater emphasis on the protection and maintenance of optimal cover that would be maintained by the near natural distribution of forest age classes, and on improving ecological conditions of natural grasslands and brushlands. Since this alternative would eliminate livestock grazing after the first decade, additional forage would be available for both deer and elk, and elk are expected to increase in these areas where both summer and winter range is adequate.

From a landscape perspective, foraging areas resulting from plantations would decrease from historic levels, from 91,600 to 49,600 acres. A sharp decline from current levels would occur for 3 decades and then stabilize at about 54 percent of the current acreage. Existing deer populations would also be expected to decline, similar to alternative OGR, and deer densities would be expected to return to historic densities, with occasional episodic increases in response to catastrophic fires. Elk would be expected to continue their expansion onto the forest, similar to alternative OGR.

**Black bear:** The ECR alternative would maintain large contiguous areas of mature and old-growth forests, with small widely distributed areas of early successional habitat for foraging, which may be limiting. Silvicultural strategy 6 would be expected to provide near natural mature and old-growth stands and would maintain the large down logs used for denning and foraging at close to 100 percent of what occurred historically.

**Management indicator species:**

**Pileated woodpecker:** Alternative ECR would manage all suited timber land under silvicultural strategy 6 and would retain special habitat components, specifically snags and down logs, at close to 100 percent of natural levels throughout the forest. From a landscape perspective, the forest would be expected to maintain suitable habitat. Contiguous areas of sufficient size and distribution would be present throughout the forest, and snags and down logs would reflect background conditions.

**Management indicator species assemblages:**

**Riparian Management Area (RMA):** RMAs would be managed under silvicultural strategy 6 in this alternative. The habitat within the RMAs would be managed to reflect natural processes and adjacent forest age and conditions. Habitat quality would improve for forest interior wildlife species as the RMAs become more similar to adjacent upland forests. Standards and guidelines are expected to maintain suitable habitat conditions for most riparian wildlife species.

**Snag and down woody debris:** Snag and down woody debris components would be maintained at the 80 to 100 percent retention level Forest-wide, including the General Forest Management Area, and would maintain habitat quality for most wildlife species over time. This level of snag and down log retention would be expected to maintain suitable habitat conditions through the 333 year rotation for most snag dependent wildlife species and those species that require down woody material. The timber harvest associated with silvicultural strategy 6 could locally displace or reduce existing individuals; however, the habitat would be expected to become recolonized during the rotation.

**Biological diversity:**

**Habitat diversity and fragmentation:** Harvest of old-growth forests under this alternative should not increase fragmentation. This alternative would use silvicultural systems that maintain old-growth structural components (legacy), which should reduce the time until the regenerated stand would provide the habitat function of the original old-growth forest ecosystem from 200-300 years to functionally mature forest at 80-120 years. Habitat diversity within the Forest matrix would be slightly decreased. Harvest would reduce interior forest habitat similar to alternative OGR. This alternative has standards and guidelines for locating harvest units such that fragmentation would be reduced as much as possible in a managed setting.

This alternative does not identify ecological corridors per se; however, fragmentation from a landscape perspective is not likely to be increased, given the desired future condition of forest watersheds (30 percent mature forest and 55 percent old-growth forest). Regeneration harvests would only be used in old-growth stands when these amounts are exceeded. Eighty percent of each watershed in a mature or old-growth condition would be sufficient to prevent isolation of wildlife populations.

**Ecological corridors:** Ecological corridors would not be needed under this alternative due to the relatively small amount of land treated each decade and the large amount of land that would eventually provide mature forest conditions. The 50-11-40 rule would still be implemented. Management during the planning period would avoid creating barriers to dispersal and ensure connectivity similar to alternatives PRF and OGR.

## Indirect Effects:

Designated habitat allocations for both Dedicated and Managed Wildlife Habitat Management Areas (outside reserved land, categories 1 and 2 HCAs, and NSO CHUs) could be managed under silvicultural strategy 6 following completion of site specific management plans and consultation with the USFWS. Open roads reduce habitat capability for many species of wildlife, and disturbance from roads could displace breeding individuals. The Forest standards and guidelines would provide seasonal restrictions to protect essential occupied territories. Recreational opportunities associated with viewing and hunting wildlife would increase as access to previously unroaded areas is developed. The small increase in open road densities Forest-wide would result in disturbance to some wildlife.

## Cumulative Effects:

Timber harvest on areas suited for timber, implemented under silvicultural strategy 6 with a 333 year rotation, would provide a mosaic of all age classes of forest habitat throughout the Forest. The large contiguous areas of mature and old-growth forests would provide for those wildlife species dependent on the mature and old-growth successional stages. Habitat for those species dependent on earlier successional stages would decline during the first 3 decades, particularly within the set-aside lands, as existing plantations mature into young pole stands. Mature forest habitat would gradually increase, as ingrowth from younger stands begins to exceed the acres harvested, and selectively harvested areas begin to provide functional habitat.

## Summary of Wildlife Consequences

The consequences to wildlife under the various alternatives are summarized here in response to the issues presented at the beginning of this section.

Issue 1. How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

This EIS analyzed a broad and complex range of management strategies, including the SAT and FEMAT reports, that would provide for the maintenance of biodiversity at various levels of risk. Suitable habitat was designated for federally listed wildlife species and selected sensitive species to ensure a well distributed array of occupied territories, or potentially suitable habitat that would contribute to the maintenance of viable populations throughout the Klamath Province. The Forest will continue to work in consultation with the USFWS to achieve recovery plan goals for all federally listed wildlife species. Alternatives PRF, OGR, and ECR would be expected to maintain viable populations forest-wide, and assume different levels of risk. Alternatives PRF, OGR and ECR propose strategies that should ensure a high likelihood of viability for all forest species. Alternative PRF is expected to ensure spotted owl viability similar to OGR and ECR, but assumes some risk in the management of designated habitat for other Sensitive wildlife species, and the CUR alternative would have a moderate likelihood of maintaining sufficient suitable habitat to ensure that the Forest would contribute to maintaining viable marbled murrelet, fisher, marten, and/or goshawk populations. Based on the FSEIS and FSEIS-ROD, all alternatives, including MKT, would provide for a high likelihood of viability of northern spotted owl populations. The MKT alternative, however, would have the lowest likelihood of maintaining sufficient suitable habitat to contribute to maintaining viable populations of wildlife species, such as the marbled murrelet, fisher, and marten, associated with late-successional forests. The Forest would likely need to protect additional land within the Forest matrix to ensure additional wildlife species would not be listed or to ensure recovery of other listed species.

Issue 10. How will Forest Plan allocations and their respective management prescriptions affect wildlife?

Alternatives PRF and ECR would have the least effect on wildlife species dependent on mature and old-growth forests and the greatest effect on wildlife that need early successional forest conditions. Alternatives PRF and OGR provide large reserves (LSRs and HCAs, respectively) which are expected to be adequate for most species, while alternative ECR provides a forest environment of predominantly mature and overmature forest conditions that would preclude the need for large reserves or set-asides. Alternatives CUR and MKT would have a greater adverse effect on wildlife species dependent on mature and old-growth forests. Alternative MKT would create the greatest increase in plantations and would not provide for marbled murrelet or marten and fisher consistent with PSW's literature review. Alternative PRF would provide gradually increasing levels of functional mature and late-successional forest conditions, including an increase in closed canopy forest and corresponding decreases in open canopied forest. Alternative PRF would also thin or regenerate some early and mid mature forest stands that occur on timber suited lands to achieve the relative variation in mature forest stands that have old-growth legacy (including snags and down wood) and that are likely to be capable of supporting late-successional wildlife. Alternative PRF also assumes the risk that the functional habitat created by silvicultural strategy 5 (both regeneration with legacy and ITS) would maintain sufficient spotted owls and functionally suitable habitat within the forest matrix to demonstrate that similar management within the large late successional reserves would not be likely to adversely affect these federally listed species.

Issue 11. How should wildlife habitats on the Forest be managed?

Alternatives PRF, OGR, and ECR propose unique silvicultural strategies which, in conjunction with Forest standards and guidelines, would provide "green tree retention" and a legacy of snags and down logs, from the existing forest and better reflect natural processes and conditions that occur in the Forest. These alternatives would increase the relative amount of closed canopy forest and maintain high levels of special habitat components, and would implement unique standards and guidelines to reduce adverse effects to several wildlife species with emerging viability concerns. Alternatives CUR and MKT emphasize more traditional harvest methods that would increase the amount of young forest and maintain minimum levels of special habitat components. Alternative MKT would provide a low likelihood of the Forest contributing to viable, well distributed populations of some sensitive species. Alternative PRF would set aside the most mature and old-growth forest as LSRs, while the other alternatives would eventually manage most mature and old-growth forests that occur on timber suited land within the General Forest Management Area or matrix.

Issue 12. How has the ecological corridor concept been treated on the Forest?

Alternatives PRF and OGR would maintain functional forested corridors in a contiguous (early-, mid-, late-, and older) mature forest condition that would provide connectivity between existing and planned reserves (Wilderness, HCAs or LSRs, designated wildlife habitat management areas, or other reserved lands). The PRF alternative includes large riparian reserves and 100-acre spotted owl cores at activity centers located on matrix lands to compensate, in part, for dropping the 50-11-40 rule. Alternative ECR assumes the relative amounts of mature and old-growth habitat maintained by the silvicultural strategy used would preclude the need for ecological corridors, since more than half of the forested landscape would be composed of mature or older forests. Alternatives CUR and MKT would not maintain ecological corridors, but would rely on the expanded riparian corridors, the 50-11-40 habitat, and other management areas to provide some connectivity. The strategies in alternatives CUR and MKT pose the greatest risk to dispersal and re-occupation of vacant suitable habitat.

## RIPARIAN ZONES

### Introduction

This section discusses the effects of alternatives in relation to the following issue.

Issue 3 How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems?

Effects on water quality and yield, fish habitat, and wildlife are discussed in those resource sections elsewhere in this chapter. The effects of the alternatives on wetlands and riparian zones are discussed here by the following activities that can have major effects on wetlands and riparian zones: fuels management, range management, timber management, and fish and wildlife program management.

The fish and wildlife management programs include projects designed to increase habitat diversity and capability, in order to maintain viable wildlife populations, and to improve fish habitat. Projects designed to enhance instream fish habitat include planting riparian species (alder and willow, for example) for increased shade, increased stream productivity, and improved bank stability. Projects designed to enhance wildlife habitat diversity and productivity include constructing artificial nest platforms, inducing snags and down logs, closing roads, and manipulating vegetation and surface flow to enhance growth of riparian species.

The management emphasis for wetlands and riparian zones in all alternatives is to maintain or improve the "riparian dependent resources." These are water, fish, riparian-dependent wildlife species, riparian-related aesthetics, and vegetation associated with the riparian zone. Management activities such as timber harvest and grazing are allowed in wetlands and riparian zones only to the extent that riparian dependent resources are maintained or improved.

### Consequences Common to All Alternatives

The primary potential effects related to management of wetlands and riparian zones are effects on water quality and yield, fish habitat, riparian-dependent wildlife species (including amphibians, reptiles, and molluscs), riparian-related aesthetics, and riparian and aquatic vegetation. Mitigations described below would assure that the potential impact to riparian zones would be low for all alternatives. There are differences among alternatives with regard to increased riparian zone protection and regulated harvest within these zones, as discussed below.

**Fuels management**: Using fire to reduce the quantity of slash (fallen woody debris) after logging could directly affect wetland and riparian zones. Failure of firelines to contain fire in cutover areas adjacent to wetlands or riparian zones could result in the fire consuming the vegetation in portions of these areas. On steeper slopes, burning logs or debris might roll into wetlands or riparian zones with similar consequences. Small intrusions into the riparian zone by fire might increase edge effect and improve vertical habitat diversity, with very minor effects on fish, water quality, and riparian-dependent wildlife. Larger openings might adversely affect forest interior species such as spotted owls and adversely impact water quality and the fish and wildlife habitat noted above.

**Range management:** The greatest adverse impacts from livestock grazing on wetlands and riparian zones are caused by overconsuming and trampling of riparian vegetation and breakdown of stream banks, resulting in degraded riparian and aquatic habitat. The magnitude of adverse impacts would depend on the long-term duration and intensity of livestock grazing, and the types of stocking practices employed (numbers, distribution, and timing).

**Timber management:** Logging and road construction could alter the riparian and wetland area directly by removing coniferous vegetation and by altering the microclimate through removal of shade canopy. Microclimate could determine what species would be able to survive in the less shaded riparian zone, favoring the species tolerant of open, dryer conditions. Removal of large commercial trees could also increase the groundwater in these areas, favorably affecting water-dependent plant species. Uneven-age management and individual tree selection, in areas of 1/10 acre or less, would be the preferred silvicultural systems for use in wetland and riparian zones. The common result, after recovery from logging disturbance, would be a multi-storied coniferous forest with the understory dominated by denser stands of species such as alder, willow, and maple.

The dominant vegetation in the general area would continue to be composed of stands of medium to large

Douglas-fir, alder, willow, cottonwood, tanoak, and madrone. Older stands would be replaced by younger stands in some areas if timber harvest activities are conducted. In these areas, available water would be increased for a few years, and shade-intolerant species would be favored. In other cases, the vegetation would be partially or totally removed where road crossings and access trails are created.

**Fish and wildlife program management:** Threatened, endangered, and sensitive and survey and manage species (ROD, 1994) that are associated with riparian areas would be protected consistent with direction in the FSEIS and ROD. Habitat structure and composition of riparian zones along streams and wetlands would remain similar to the current situation during the next decade, assuming catastrophic wildfires do not occur. With the exception of required stream crossings, deciduous riparian vegetation along the immediate streamside would remain essentially unchanged, except as discussed below by alternative.

## Mitigations Common to All Alternatives

Mitigations relative to range management are common to all alternatives. Other mitigations are specific to each alternative.

**Range Management:** The impacts upon the riparian zone from livestock grazing would be controlled through monitoring and control of animal numbers, distribution, and season of use, as well as riparian zone exclosures where necessary to facilitate recovery of degraded riparian habitat.

## Consequences and Mitigations Specific to An Alternative

## CUR and MKT Alternatives

These alternatives present the highest relative risk for negative modification of the riparian zone. These alternatives differ in the amount of potential timber harvest, but effects would be similar.

## Consequences:

Both alternatives include major amounts of riparian reserve that would be scheduled for regulated timber harvest: 15,330 and 15,820 acres, respectively, for the CUR and MKT alternatives. When logging operations are to be conducted near a stream, the risk of damage to the riparian resource is increased. The scheduled timber harvest would approximate a long rotation, probably affecting about 50 acres annually. Both alternatives propose to increase grazing from current levels. Although both alternatives propose improvements to maintain the range resource, there would be an increased risk of adverse impacts to riparian zones. As the MKT alternative would have higher grazing levels and allotments would be fully stocked, the risk of adverse impacts would be higher than in the CUR alternative.

## Mitigations:

Harvest in riparian zones would be limited to conifers. Shade canopy and bank stability requirements would be met through implementation of current (1984 Interim) standards and guidelines and best management practices. Current forest-wide standards and guidelines require that special attention be given to the land and vegetation approximately 100 feet horizontal distance from the edge of perennial streams, lakes, ponds, and all wet areas 1/10 acre or larger to minimize adverse impacts of management activities (Geology, Soils, and watershed management standards). Best management practices (see Water section in this chapter) would also mitigate effects.

## PRF and OGR Alternatives

These alternatives have fewer acres of timber-suited land than the CUR and MKT alternatives. Under the PRF and OGR alternatives, no part of the Forest would be managed solely for timber outputs; rather, the timber-suited land base would be managed with reduced yields to emphasize wildlife habitat, visual quality, and other amenities. The PRF alternative would be designed to mimic natural succession of all vegetative types on the Forest. No lands within riparian zones would be scheduled for regulated harvest objectives. The PRF alternative would maintain grazing at current levels, and the OGR alternative would eliminate grazing from wilderness areas. Riparian reserve standards and guidelines in the PRF alternative would provide additional protection for riparian zones. The risk of adverse impacts from grazing would be much lower than in the CUR and MKT alternatives.

## Consequences:

Land and vegetation disturbing activities within riparian zones would be greatly reduced under these alternatives. The current trends and rates of

vegetation successional change would continue. Older trees would be recruited to the channel as they die, providing essential habitat for aquatic organisms.

### Mitigations:

Riparian reserve widths would be increased significantly. Riparian zone protection measures in these alternatives would constrain management activities adjacent to riparian zones to a greater degree than the CUR and MKT alternatives (see Riparian Reserve Management Area discussion in Chapter 4 of the Forest Plan). The "Key Watershed Program," in which watersheds of key importance to anadromous fish populations are given first priority when assessing management alternatives should increase the overall protection and maintenance of riparian zones because of their importance to fish habitat.

## ECR Alternative

The ECR alternative includes 15,810 acres of riparian reserve for regulated harvest. This alternative has an amount of timber suitable for management equal to the MKT alternative, but the rotation age would be 300 years, as opposed to the former of 100 years.

### Consequences:

The ECR alternative would attempt to maximize late seral stage old growth vegetation in the Forest. The area of affected riparian zones per decade would be approximately one-third of that attributed to the CUR and MKT alternatives, by virtue of the longer rotation age. This alternative has constructed road-miles equal to the MKT alternative resulting in increased impact to riparian zones due to the number of road crossings. The natural succession of vegetation in a forest includes alteration of riparian zones, primarily by management that emulates wildfire and other natural occurrences. As grazing would be eliminated during the first decade, there would be no adverse impacts to riparian zones.

### Mitigations:

Standards and guidelines and best management practices similar to those in the CUR and MKT alternatives would be used to mitigate effects.

# FISHERIES

## Introduction

This section discusses the effects of alternatives in relation to the following issues:

Issue 3 How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems?

Issue 13 How will the Forest maintain or improve the quality and quantity of spawning and rearing habitat?

Several phases of Forest management have the potential to affect fish habitat. In order of decreasing importance on Six Rivers National Forest they are:

1. Timber harvest and associated roads
2. Fire and fuels management
3. Livestock grazing

Each of these activities has the potential to cause detrimental changes to fish habitat through increased erosion or alteration of the vegetation within riparian reserves. The effects are manifested as increased deposition of fine sediment, reduced habitat diversity and quality, reduced aquatic food supply, and increased water temperature regime. In addition to those potentially detrimental activities listed above, the instream work done to improve fish habitat has the potential to increase sediment deposition in the short term.

Fine sediment fills pools and deposits in spawning gravel and the rocky stream bottom. Filling of pools reduces available living space for juvenile fish. Sediment deposited in spawning gravel reduces survival from the egg-to-fry emergence stages of salmonids (salmon and trout). Sediment deposited on the stream bottom reduces available living space for aquatic insects, thereby decreasing the primary food supply for stream fishes. Reducing the potential supply of large woody debris through harvest or fire causes reduced recruitment of fallen trees to the channel, thereby constraining the stream habitat below optimum. Instream shelter is necessary to provide refuge adjacent to the primary feeding territory. In addition, large wood in streams is the primary refuge of juvenile salmonids during extreme high winter flows common to the north coast of California. Complex stream structure is a vital contributor to the viability of the aquatic community.

The temperature regime in streams is a function of direct solar radiation; therefore, a relatively dense shade canopy is essential to maintaining summer water temperatures suitable for salmonids. The primary contributor to stream shade canopy on the Forest is the adjacent vegetation, dominated by conifers, alders, willows, and shrubs. Increases in water temperature are seldom high enough to cause direct mortality. Instead, the more common effect is reduced growth rate, thus reducing the overall fish production of the stream. Reduction of riparian vegetative canopy also reduces the supply of vegetative matter to the basic aquatic food chain. In addition, overhanging vegetation is an important source of food for stream fishes because of the input of terrestrial insects, common on riparian vegetation.

## Consequences and Mitigations Common to All Alternatives

The potential effects on fish habitat, based upon changes in water quality, are low for all alternatives (see “Water” section). Each of the above-noted forest activities with potential to affect fish habitat is discussed here for all alternatives. Each activity is more fully discussed under the Water section in this chapter. Levels of risk for potential effects vary by alternative and are discussed under consequences specific to an alternative.

## Timber Management:

**Direct, Indirect, and Cumulative Effects:** Timber harvest could produce increased sediment yield from erosion of logged areas or destabilization of slopes adjacent to streams. The largest potential for increased sediment yield, however, would be the roads necessary to manage the timber resource. Roads have been documented to be the major cause of landslides resulting from human activities in the steep and frequently unstable forest land of the Pacific Northwest (Huffman, 1977; Seidelman, 1977; Furniss et al., 1991).

**Mitigations:** The Forest approach to reducing landslides related to roads or timber harvest is to perform thorough assessment by trained professional geologists and hydrologists and road design by professional engineers. Recognizing potentially unstable areas is critical to maintaining fish habitat.

Road design is very important to prevent long term erosion. Specific designs would allow minimal concentration of runoff, properly sized drainage structures, and carefully designed stream crossings.

## Fuels Management:

**Direct, Indirect, and Cumulative Effects:** Harvesting conifers normally generates moderate to large accumulations of slash (woody debris) that is usually burned in order to facilitate replanting trees and to reduce fire hazards. Riparian management areas are often adjacent to harvest units with high slash accumulations. Unless carefully controlled, slash burning could ignite the riparian area, burning all riparian vegetation and possibly destabilizing the slope and streambank. The riparian vegetation would return in time, but full recovery could take many years.

**Mitigation:** Fuel breaks and piling slash are effective to protect riparian areas on slopes where tractors can be operated. On steeper slopes, where the potential is high for ignition of the riparian vegetation, the most effective technique is to burn the adjacent logging slash (waste) when fuel moistures are just high enough to burn. At that time, fuel moistures within the shaded riparian management area should be sufficient to prevent ignition.

## Range Management:

**Direct, Indirect, and Cumulative Effects:** Cattle grazing has only a moderate Forest-wide potential to affect fish habitat, because of relative lack of grazed riparian areas on the Forest. At localized sites such as meadow streams, however, the impact could be significant. Overgrazing results in a loss of the riparian vegetation which is key to bank stability. The result is loss of valuable trout cover and shade canopy, and increased erosion. Increased eutrophication (lower instream oxygen levels) resulting from cattle droppings can be a concern in grazed, low-flow streams, such as the North Fork, Eel River. The impacts can be difficult to evaluate, because they may be the result of over 75 years of grazing.

**Mitigations:** Keys to restoring streams degraded by livestock are to protect the streambank by fencing it or limiting the length of time livestock are permitted stream access and to plant riparian vegetation. Designs for stream protection structures must consider watering access or alternative developed sites for cattle.

## Instream Habitat Improvement:

**Direct, Indirect, and Cumulative Effects:** The Forest's current program of instream habitat improvement is primarily directed at modification of anadromous fish (salmon and steelhead) habitat. The level of habitat restoration would be the same under all alternatives. Opportunities for habitat improvement are continually assessed as part of a comprehensive, long-term program to restore the health of the aquatic ecosystems on the Forest. We expect that significant funding will continue for this major emphasis program on the Forest. In implementing projects, it is often necessary to disturb the stream bottom with construction equipment in order to provide optimal structural stability during winter flows. Any short-term detrimental effects of construction-related sedimentation is far outweighed by the benefits of the improved habitat. The increased habitat complexity would result in increased production of steelhead, salmon, and trout.

**Mitigations:** The sediment generated from fish habitat projects is kept to an absolute minimum by close supervision during construction. Most deposited sediment is transported downstream during the winter flows. Any short-term detrimental effect of construction-related sedimentation is far outweighed by the benefits of the improved habitat. Structures have a predicted effective life of 10 to 20 years, depending on individual design characteristics.

**Cumulative Effects:** Cumulative watershed effects are determined in terms of the number of Forest watersheds that are at less than 40 percent of the threshold of concern (TOC). The TOC of Forest watersheds varies from 10 to 15 percent dependent upon watershed sensitivity and condition (see discussion in Water section). Watersheds at or over the TOC are at risk for cumulative degradation of channel stability and water quality, which would impact fish habitat. At the end of the first decade the PRF alternative would have 123 watersheds that would be at less than 40 percent of the TOC. The CUR and MKT alternatives would have 114 and 115 watersheds, respectively, in that status. The OGR and ECR alternatives would have 120 watersheds at less than 40 percent of the TOC. The PRF alternative in this analysis would have the lowest potential cumulative effect upon fish habitat. The real value of cumulative effects analysis is apparent in the project phase of planning. Watersheds are individually analyzed and projects designed to prevent or mitigate impacts to water quality and fish habitat.

**Mitigations:** Past and potential cumulative watershed effects are assessed for each watershed encompassing a proposed timber sale. The effect of private timber lands in the watershed is included in the assessment. The projects are designed to prevent or mitigate impacts to water quality and fish habitat. If the cumulative watershed effects cannot be mitigated, projects are not implemented, and a watershed and fish habitat restoration program is initiated.

## Consequences and Mitigations Specific to An Alternative

The following consequences and mitigations relate to timber and fuels management only.

## CUR Alternative

This alternative reflects current management, which incorporates a reasonably high level of protection for the riparian area.

## Direct and Indirect Effects:

Regulated harvest and salvage would be permitted in the riparian zone, limited by provisions for maintenance of shade canopy and bank stability (see Riparian Reserve Management Area, Plan Chapter 4). A total of 14,670 acres of riparian reserves would be suitable for timber harvest; this would include about 1,200 miles of channels on the Forest. The management would approximate a long timber rotation, theoretically impacting about 40 miles per decade. The highest risk to fish habitat is the potential removal of trees that could contribute to instream habitat as shelter (large woody debris) for juvenile salmonids. Potential sediment yield would be moderate in comparison to the other alternatives, based upon the acreage to be harvested and miles of road to be constructed. The risk to retention of the riparian area (and consequent loss of fish habitat) from treatment of adjacent logging slash would be relatively high because of the higher fuel accumulations common in clearcutting.

## Mitigations:

Timber harvest operations within the riparian area would be carefully controlled in order to protect streambanks and non-coniferous vegetation from equipment damage. Specific clauses for stream protection are included in timber sale contracts. The fire risk to riparian areas can be greatly reduced by doing spring burns in critical areas identified in the timber sale environmental analysis.

## PRF Alternative

## Direct and Indirect Effects:

This alternative would have very low impact upon riparian vegetation because no timber harvest or salvage would be allowed within the riparian reserve management area on perennial streams or intermittent channels. Potential sediment yield to streams from roads and harvest units would be the lowest of all alternatives, because of the lesser amount of timber harvest and road construction (see Table IV-3 in Water section). The potential impact from fuels management would be extremely low due to the limited use of clearcutting and emphasis upon retention of forest debris for wildlife. There would be some increased risk of wildfire because of the amount of retained forest debris. This alternative also includes the “key watershed program” which encompasses approximately 70 percent of the Forest. In this program identified watersheds having importance to anadromous fish populations would be managed with the fish resource receiving primary consideration when assessing management alternatives and activities in those watersheds.

## Mitigations:

Protection and maintenance of the riparian zone is dependent upon strict application of Forest standards and guidelines and best management practices (see Riparian Zone section in this chapter and Riparian Reserve Management Area, Plan Chapter 4). The key watershed program requires that management alternatives which are implemented for these watersheds have low or no risk to anadromous fish habitat (See Aquatic and Riparian Ecosystems, Plan Chapter 4).

## OGR Alternative

## Direct and Indirect Effects:

The effects of this alternative with regard to potential stream sedimentation would be slightly higher than the PRF alternative, having a 10 percent increase in road miles and a 3 percent increase in timber harvest.

### Mitigations:

Same as for the PRF alternative.

## MKT Alternative

### Direct and Indirect Effects:

This alternative would have the highest timber harvest of all alternatives and therefore presents the highest risk for increased production of sediment,

primarily from increased road construction. The harvest level would be 250 percent higher than the PRF alternative. In addition, 10,070 acres of riparian reserves would be classed as suitable for timber harvest, with consequent risk to bank stability and non-conifer vegetation, primarily along small perennial and intermittent channels. Increased erosion in these headwater channels could result in degradation of downstream fish habitat. Using the clearcut strategy would cause the highest risk to stream habitat from fuels treatment following harvest, for the reasons stated for the CUR alternative.

### Mitigations:

The mitigations are the same as for the CUR alternative. Best management practices apply, as do the 1984 standards and guidelines. The key watershed program for anadromous fish is not included.

## ECR Alternative

### Direct and Indirect Effects:

This alternative attempts to mimic the natural succession of growth, decay, and regeneration of the Forest. A total of 222,000 acres of the Forest would be included in the available timber base, which is more than double any other alternative. A total of 15,810 acres of the riparian reserve management area would be suitable for regulated harvest under extended rotations. The acres of regulated harvest would be 39 percent higher than the PRF alternative. This alternative has the highest amount of road miles because of the necessary wide distribution of harvest areas. The potential for more stream crossings would increase the risk of higher levels of sedimentation in fish-bearing streams. The potential impact on fish habitat of fuels management would be very low, even though clearcutting would be allowed, because of the required proportion of each watershed that must be maintained in natural condition.

### Mitigations:

Standards and guidelines (1984) and best management practices for protection of riparian zones must be met during timber harvest operations. The harvest within the riparian zones would be on a 300 year rotation, and water dependent resources would take precedence over timber yield.

# SOCIAL AND ECONOMIC ENVIRONMENT

## SOCIAL

### Introduction

This section discusses the effects of alternatives in relation to the following issues.

Issue 1 How will the Forest maintain biodiversity or viable populations of all native and desirable non-native plant and animal species?

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities?

Issue 17 What constitutes reasonable protection of Indian cultural activities and values?

Other issues that play a subsidiary role in the social environment are considered here as part of the above issues; they are addressed further in pertinent sections of this chapter.

Issue 3 How will the Forest manage riparian zones to help reverse the apparent decline in the yield of anadromous fisheries, and to maintain or restore the ecological processes and functions of riparian ecosystems? (See Fisheries and Riparian Zones section.)

Issue 18 Has the Forest considered stopping new road construction and/or obliterating existing roads? (See Transportation and Facilities Management section.)

Issue 22 How should the Forest manage the range resource? (See Range Management section.)

Issue 24 How many miles of trails will be constructed and maintained on the Forest? (See Recreation Program Management section.)

Issue 38 How much of the Forest scenery is to remain natural appearing? (See Visual Resource Management section.)

Issue 6 How will adverse cumulative effects on water quality be prevented? (See Water section.)

Major changes have occurred, since the 1989 base year, including the following actions.

1. Congress designated the Smith River National Recreation Area (SRNRA) in November, 1990.

2. U.S. Fish and Wildlife Service (USFWS) listed the northern spotted owl and marbled murrelet as Threatened species.

3. The American Fisheries Society identified 214 anadromous fish stocks that need special management consideration because of low or declining numbers.

4. USFWS published the final rule determining critical habitat for the northern spotted owl in the Federal Register in January, 1992

5. Secretaries of Interior and Agriculture signed the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl in April, 1994.

These changes have altered land use allocations and the type and amounts of goods and services that can be produced on the Forest. Four unresolved, concurrent issues that have potential to affect the planning process were identified in Chapter 2. These issues, and the possible court injunctions against timber harvesting, drive changes in direction and policy that are further affecting the existing conditions under which the Forest operates. Each of these issues has the potential to further alter the outcome of the planning process and Forest management.

Four social categories — Amenity Emphasis, Environmental Priority, Native American, and Commodity Dependent — were identified and discussed in Chapter 3 in terms of their values relating to forest management and the behaviors they engage in which reflect these values. This section will address how these behaviors and values are likely to be affected by management of Six Rivers National Forest, as proposed by the alternatives, under existing policy, direction, or law.

There are established measurements and thresholds for resources like water, wildlife, and timber which enable

the analyst to determine "breaking points" which indicate when the resource in question is likely to suffer adverse effects. These kinds of measurements also serve to indicate the point at which secondary effects of impacts begin to come into play. Unfortunately, the processes at work in the area of social interaction are not as clearly defined or understood. While it may be shown that certain groups would be affected by management or policy changes in an area that contributes to their behaviors or lifestyles, it is not possible to determine how changes in several areas at one time may affect a group or the community as a whole. Some changes will have a greater effect than others, and changes in one area may increase or decrease the effect of changes in another area. As a result, determining the overall effect of an alternative is not possible with available data. Therefore, outcomes for outputs and values of concern to the social groups are listed by output rather than by alternative. Differences in outcomes between each alternative, where they occur, will most likely be differences in degree. Other factors, such as social trends, which may compound or increase the anticipated effects will be cited.

This section is organized somewhat differently than other sections in this chapter. The following discussions refer to the various outputs, values, and policies that were identified in Chapter 3 as being linked to the lifestyles and behaviors of the various groups. The section "Consequences Common to All Alternatives" discusses outputs, values, and conditions for resources which do not vary by alternative: air quality, cultural forest products, culturally important wildlife, and Native American spiritual use areas. No mitigations common to all alternatives were identified. The section "Consequences and Mitigations Specific to An Alternative" discusses outputs, values, and conditions for resources which have some commonalities but also vary among alternatives: biodiversity, community stability and cohesion, fisheries, range, roads, site conversion, timber, trails system, visual quality, and water quality.

## Consequences Common to All Alternatives

### Air Quality:

**Consequences:** All social groups identified air quality as important to their values and behaviors.

**Direct and Indirect Effects:** The Forest management practice that directly affects air quality is fuels treatment through prescribed burning. Prescribed burning will cause short duration localized air quality degradation, but this activity will occur on small areas spread over the entire Forest. All alternatives would have very little, if any, noticeable effects on the values or behaviors of the social groups in either the short or the long-term, as all alternatives would be mitigated through the maintenance of air quality standards. See the Air Quality section of this chapter for more information.

**Mitigation:** Fuels treatment for all alternatives would meet California air quality standards as described in the Forest-wide Air Quality standards and guidelines in Chapter 4 of the Forest Plan.

### Cultural Forest Products:

**Consequences:** Regional policy has been developed to govern the gathering of plants traditionally used by Native Americans. This policy provides for plant gathering without fee or permit for individual consumption, crafts, ceremonial use, and other cultural, non-commercial activities, and allows for the development of management practices designed to perpetuate or increase the production of culturally important plant resources. While this policy does not preclude the commercial sale of these products, such sales should be conducted in such a way that personal or community cultural uses are not jeopardized. Effects on personal or community gathering should be considered in planning and decision making for timber sales and other activities. This policy includes, but is not limited to:

1. Trees, bark, and shrubs: examples are willow, manzanita, cedar. (Policy relating specifically to Pacific yew is discussed below.)

2. Roots and bulbs: an example is onions.

3. Herbs, forbs, ferns, and grasses: an example is bear grass (*Xerophyllum tenax*).

4. Mushrooms and fungi. (Commercial mushroom gathering is discussed below).

5. Seeds, nuts, and fruits: an example is acorns.

6. Mosses and lichen.

Permits for gathering Pacific yew wood for non-commercial cultural uses may be purchased; the wood must be obtained from areas outside of designated

Critical Habitat Areas for spotted owl. Users who want permits should contact their local Forest Service Ranger Station or the Supervisor's Office for details.

Commercial gathering of miscellaneous forest products, such as mushrooms or other plants, requires purchase of a permit.

Native Americans are most affected by this policy; many of them gather plant resources in their practice of traditional lifestyles. It is expected that the policy as described above will not have an adverse affect on Native American lifestyles, since availability of these resources for cultural uses is assured, allowing for the continuation of Native American cultural practices which rely on their availability. There is also the potential to have a positive effect, as methods and funding for improving culturally important plant populations are developed over time. Fees for gathering Pacific yew are not believed to be prohibitive for Native American users and should, therefore, have no adverse effect on its availability.

Amenity-emphasis residents are not expected to be adversely impacted by this policy, since they are not excluded from personal consumption of forest products such as mushrooms.

## Culturally Important Wildlife:

**Consequences:** The hunting or "take" of animals on National Forest System lands is governed by both federal and state laws, including the Federal Migratory Bird Treaty Act and the Endangered Species Act. However, Native American hunting for ceremonial or spiritual uses is a more complex issue, and is the responsibility of the State. Wildlife such as deer are readily available within regulated hunting seasons, but hunting protected species such as pileated woodpecker or marten is not permitted on any public lands outside designated Tribal lands in order to protect the viability of the species.

Native American hunting of culturally important wildlife on tribal lands such as the Hoopa and Yurok Reservations is regulated by the governing tribe. Such hunting off of tribal lands is regulated by California Department of Fish and Game on a case by case basis, where the hunter establishes his/her tribal affiliation and the ceremonial use of the hunted animal (Scott Pearson, Senior Resident Agent for CDF&G, personal communication, 1/26/93). The result is that those groups who do not have status as a Federally Recognized Tribe, or who have no tribal lands, have no clear provision for hunting culturally important wildlife. Several Native American groups in the area are adversely affected by this lack of provision, among them the Tolowa and the Tsnungwe.

## Native American Spiritual Use Areas:

**Consequences:** Protection of traditional Native American spiritual areas, and ensuring access to those areas by Native American users, are provided for in the following Federal laws and regulations.

National Historic Preservation Act of 1966, as amended
Archaeological Resource Protection Act of 1979
American Indian Religious Freedom Act
U.S. Constitution, First Amendment
36 CFR Part 800
Civil Rights Act of 1964, as amended

These laws require that local Native Americans be consulted when land management proposals have the potential to affect spiritual areas or properties. They also require that Native American spiritual users be allowed access to spiritual sites on public lands. Management relating to these areas will be consistent with these laws.

Most of the identified spiritually important areas on Six Rivers are within delineated wilderness. A few areas are located outside of wilderness. There has been potential for conflict between Native American spiritual users and other social groups. Trail and road systems are often shared, high peaks areas used for spiritual practices are also favored vista points for recreationists and hunters, and flat areas along rivers are also used for recreational and fishing access to the rivers. Six Rivers will work closely with Native American spiritual users to determine reasonable and appropriate management strategies for these areas.

It is not expected that Native American spiritual practices will be denied by these policies.

## Consequences and Mitigations Specific to An Alternative

## Biodiversity:

Plant and animal diversity was identified as important to the values and behaviors of the Environmental Priority and Native American social groups. Biodiversity in its simplest terms is variety of life

forms and processes. It includes the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur. The science of biodiversity is still in its infancy and surrounded by uncertainty. Personal beliefs, values, opinions, and concerns about what is beneficial in terms of biodiversity vary within the Environmental Priority group. This discussion will deal only with the effects of the alternatives in terms of functional mature and late successional stage wildlife habitat, since the greatest loss in biodiversity has been within these vegetational communities and associated animal populations (see Wildlife and Biological Diversity sections for full discussions on biodiversity, NFMA requirements, and species viability).

**Direct and Indirect Effects:** The amount of mature and late-successional stage habitat would increase from the beginning or current amount of 365,690 acres in each decade for the PRF, OGR, and ECR alternatives; the CUR alternative would increase to the third decade, then decrease to just above its first decade level. The MKT alternative would increase to the third decade then dip below the current level and continue to decline to the fifth decade. Table IV-13 compares projected acres of functional mature and late-successional stage wildlife habitat in each decade by alternative.

**Table IV-13. Acres of Functional Wildlife Habitat.**

| | Decade | | | | |
|---|---|---|---|---|---|
| Alt | 1 | 2 | 3 | 4 | 5 |
| CUR | 371,012 | 374,935 | 379,127 | 376,451 | 371,510 |
| PRF | 379,969 | 392,507 | 405,718 | 412,093 | 417,136 |
| OGR | 373,135 | 380,904 | 386,231 | 388,442 | 388,326 |
| MKT | 368,297 | 369,389 | 370,724 | 364,105 | 357,136 |
| ECR | 381,030 | 393,887 | 405,670 | 410,592 | 414,094 |

**CUR Alternative:** This alternative represents a perpetuation of the current vegetative condition and would have a moderate to low likelihood of maintaining some late-successional stage wildlife species over five decades. It would have the second highest negative impact to the values and behaviors of the Environmental Priority group over five decades.

**PRF Alternative:** This alternative would have the most functional habitat protected and have the highest likelihood of maintaining late-successional stage wildlife populations over five decades. It would have the highest benefit to the values and behaviors of the Environmental Priority group over five decades.

**OGR Alternative:** This alternative would protect important late successional stage vegetation types and have the third highest likelihood of maintaining late-successional stage wildlife populations over five decades. It would have the third highest negative impact to the values and behaviors of the Environmental Priority group over five decades.

**MKT Alternative:** This alternative would have the highest timber harvest levels and the lowest likelihood of maintaining late-successional stage wildlife populations over five decades. It would have the highest negative impact to the values and behaviors of the Environmental Priority group.

**ECR Alternative:** This alternative is designed to mimic natural patterns and levels of stand replacement and provide a near-natural range and distribution of habitats. It would have moderate to high likelihood of maintaining late-successional stage wildlife populations over five decades. It would have the second highest benefit to the values and behaviors of the Environmental Priority group.

**Mitigations:** No mitigations were identified specific to biodiversity.

## Community Stability and Cohesion:

Community stability is affected by changes in the social environment which cannot be effectively absorbed or assimilated into the community. The rate at which change is introduced will affect a community's ability to assimilate the change. Cohesion refers to the degree of social unity within the community. Community cohesion can be greatly aided by the selection of an alternative which is perceived as a fair compromise by the various social categories. Extremes either toward intensive timber management or wildlife land dedications intensify social polarization in the zone of influence, and could increase incidences of social conflict. Finding a level of compromise which is acceptable to user-groups on both ends of the values spectrum continues to be problematic: resource-dependent residents will not accept what they see as an implementation of "preservationist" philosophy; amenity-belief residents

mistrust nearly all agency or industry-sponsored management initiatives. Until a breakthrough of understanding is reached between these groups, conflict over resource use will continue.

It is important to note that, while Six Rivers National Forest does contribute to economic and social well-being through outputs which affect employment and income, the Forest's contribution to the overall economic stability of the primary zone of influence as it relates to timber production is only an average of 15 percent for the past 20 years, and 10.9 percent for the 1989 base year. Other factors, such as private harvest levels and mill automation have a much greater effect on employment and income in the area. Private landowners are also experiencing difficulty in getting timber harvest plans approved by the state because of the current controversy surrounding wildlife management and recent legal constraints which extend across land ownership divisions. Forest outputs influence these phenomena only minimally and indirectly. Clearly, the effects of changing economic conditions are larger than the scope of the Forest's land management policy.

Recent changes in community cohesion can, for the most part, be attributed to broad-based economic and social trends that are national and international in original scope. Concern for the environment and the growth of a national and global economy largely based on service industry, rather than the historic manufacturing industry, have both played a part in creating circumstances which have had profound effects in many rural forest communities. The zone which Six Rivers influences is only one of many such areas feeling the effects of changing values and pressure for redirection in economic emphasis.

In addition, "reverse migration," or "urban flight," has brought telling social and cultural changes to formerly isolated communities by bringing in people who were attracted to the community more by amenities than by specific economic opportunities. This phenomenon has been observed all over the country and has been the subject of much sociological and demographic study. The effects of reverse migration can range from social disruption to economic rejuvenation. A combination of both of these effects can be seen in the zone of influence, where both the economy and the community have become more diversified in the last 10 years, at least within the urban centers. The outcome has been a noticeable decline in community cohesion. Reverse migration, or urban flight, is expected to continue as the state's population grows. Likewise, future immigrants are expected to share the same emphasis on amenity resources as many of the "new rural" residents.

**Direct and Indirect Effects:** All alternatives would have a negative effect on community stability due to a drop in the ASQ from the 1989 base year and past 20-year average contribution to the Primary Zone of Influence (PZI) timber harvest (see timber in this section, and the Economics and Timber Management sections in this Chapter). Rating the alternatives by comparing them to the ASQ of the base year and average annual percent contribution to the PZI timber harvest volume can be used as only a very tentative and relative indication of the Forest's influence on community stability. The ASQ level for the alternatives range from 11.6 MMBF in the ECR alternative to 95 MMBF in the MKT alternative, representing 1.0 to 8.6 percent of the projected annual timber harvest of the primary zone of influence. This is expected to have a moderate effect on both economic and social environments in terms of jobs, attitudes, lifestyles, behaviors, and community cohesion. This effect would generally be felt by all members of the communities within the primary zone of influence, not just those in the Commodity Dependent group, due to effects on secondary businesses and the service sector. Effects would relate directly to the average annual timber output and, to a lesser degree, Forest expenditures and range and fisheries outputs (see Table IV-18 through IV-24 in the Economics section of this chapter); higher ASQ would result in fewer negative impacts.

**CUR Alternative:** This alternative would have the second highest ASQ (67 MMBF), Forest expenditures, and range outputs; therefore it would have the second lowest negative impact to community stability and cohesion over five decades.

**PRF Alternative:** This alternative would have the second lowest ASQ (15.5 MMBF) and Forest expenditures and third highest range outputs; therefore it would have the second highest negative impact to community stability and cohesion over five decades.

**OGR Alternative:** This alternative would have the third lowest ASQ (26.6 MMBF) and Forest expenditures and the second highest decrease in range outputs; therefore it would have the third lowest negative impact to community stability and cohesion over five decades.

**MKT Alternative:** This alternative would have the highest ASQ (95 MMBF), Forest expenditures, and range outputs; therefore it would have the lowest negative impact to community stability and cohesion over five decades.

**ECR Alternative:** This alternative would have the lowest ASQ (11.6 MMBF) and Forest expenditures and no range outputs after the first decade; therefore it would have the highest negative impact to community stability and cohesion over five decades.

**Mitigations:** The following mitigations could abate some of the economic and social effects that would result from a declining timber harvest:

1. Provide economic diversification assistance to local communities that are eligible for such aid under Subtitle G of the 1990 Farm Bill. This rural development package, expanded upon in the Chief's Strategic Plan for the 90s, directs the Forest Service, the Department of Agriculture, and state governments to cooperate with local rural authorities to develop economic diversification projects. This initiative allows the Forest to spend up to five percent of its income from timber receipts and user fees to provide technical assistance to local development officials. The Forest Service also has the authority to provide loans to communities to help implement rural development plans. Eligible communities could include, but are not limited to, Hoopa Valley, all of Trinity County, and the City of Fortuna. For further information regarding this initiative, see "A Strategic Plan for the 90s" and the 1990 Farm Bill, Title 23, Subtitle G; both are on file at Six Rivers National Forest.

2. Encourage broad public participation in the preparation of environmental documents. Having representatives of all interest groups working together to provide land management alternatives would promote cooperation and understanding among groups, promote understanding of Forest Service mandates and directives, and help to build community cohesion. This would also help the Forest Service balance land management concerns more effectively.

3. Promote partnerships with the US Park Service, local governments and California State Parks to implement recreation and tourism development projects, as well as other economic diversification programs.

4. Utilize disaster funding through Federal Economic Dislocation Relief.

## Fisheries:

Fisheries was identified as important to the values and behaviors of all four social groups. All view improving riparian conditions and fisheries habitat improvement projects as beneficial to both commercial and sports fisheries in general.

**Direct and Indirect Effects:** Rating the alternatives in terms of relative benefit to these social groups is based on overall cumulative effects to water quality and the riparian resource, since the fisheries programs and outputs in all alternatives would be the same and would be above the 1989 base year outputs. The CUR and MKT alternatives are viewed as having the least benefit to the values and behaviors of the three social groups. The alternatives are ranked in regard to the effects of water quality and the riparian resource on fisheries; higher benefits to fisheries correlate directly with higher beneficial effects to the social groups' values and behaviors.

**CUR Alternative:** This alternative would have the second lowest beneficial effect to the fisheries and to the social groups' values and behaviors over five decades.

**PRF Alternative:** This alternative would have the highest beneficial effects over five decades.

**OGR Alternative:** This alternative would have the second highest beneficial effects over five decades.

**MKT Alternative:** This alternative would have the lowest beneficial effects over five decades.

**ECR Alternative:** This alternative would have the third highest beneficial effects over five decades.

**Mitigations:** No mitigations were identified relative to fisheries.

## Range:

**Direct and Indirect Effects:** As stated in the Economics section, range outputs are projected to nearly double over five decades in the CUR alternative, nearly triple over five decades in the MKT alternative, remain level at 6,609 average annual AMs

in the PRF alternative, decrease slightly in the OGR alternative, and drop to none after the first decade in the ECR alternative. This management activity is seen as beneficial to the values and behaviors of the Commodity Dependent and the Native American social groups. It is also seen as non-beneficial to the values and behaviors of the Environmental Priority and Amenity Emphasis social groups. See Table IV-21 in the Economics section of this chapter.

**CUR Alternative:** Increases the AM outputs to the second highest amount (11,124 average annual AMs) in the fifth decade. This alternative would have the second highest benefit to the Commodity Dependent and Native American social groups and the second highest negative impact on the values and behaviors of the Amenity Emphasis and Environmental Priority social groups.

**PRF Alternative:** This alternative remains level in AM outputs from the first decade (6,609 average annual AMs) through the fifth decade. This alternative would have the third highest benefit to the Commodity Dependent and Native American social groups and the third highest negative impact on the values and behaviors of the Amenity Emphasis and Environmental Priority social groups.

**OGR Alternative:** This alternative decreases the AM outputs in the second decade to 5,838 average annual AMs and then remains constant through the fifth decade. This alternative would have the second highest negative impact on the values and behaviors of the Commodity Dependent and Native American social groups and the second highest benefit to the Amenity Emphasis and Environmental Priority social groups.

**MKT Alternative:** This alternative steadily increases the AM output from the first to fifth decade to 17,424 average annual AMs. This alternative would have the highest benefit to the Commodity Dependent and Native American social groups and the highest negative impact to the values and behaviors of the Amenity Emphasis and Environmental Priority social groups.

**ECR Alternative:** This alternative ceases to have a range program in the second decade and the AM output remains at zero through the fifth decade. This alternative would have the highest negative impact on the values and behaviors of the Commodity Dependent and Native American social groups, and the highest benefit to the Amenity Emphasis and Environmental Priority social groups.

**Mitigations:** No mitigations were identified relative to range management.

## Roads:

Forest access is important to the lifestyle and behaviors of three social groups: Amenity Emphasis, Commodity Dependent, and Environmental Priority.

**Direct and Indirect Effects:** The Amenity Emphasis and Commodity Dependent groups view access as not only desirable but necessary for the continued survival of their lifestyles. The Environmental Priority group views limited access as necessary but it would restrict extension of the forest transportation system. The ranking of the alternatives is based on the total miles of forest transportation system road at the end of the fifth decade in comparison to the 1989 base year of 2,489 total miles. See Table IV-26 in the transportation and facilities section of this chapter for the road miles for each alternative by decade.

**CUR Alternative:** The total Forest transportation system at the end of the fifth decade would be 2,595 miles and would have the second highest mileage above the base year. This would have the second highest benefit to the Amenity Emphasis and Commodity Dependent social groups, and the second most negative impact to the Environmental Priority group.

**PRF Alternative:** This alternative would have fewest road miles at the end of the fifth decade, 2,060 total miles, which is below the base year. It would have the most negative impact on the Amenity Emphasis and Commodity Dependent social groups and the highest benefit to the Environmental Priority group.

**OGR Alternative:** The effects of this alternative would be similar to those of the PRF alternative, except that the total mileage at the end of the fifth decade would be 2,305 total miles, which is below the base year. It would have the second highest negative impact to the Amenity Emphasis and Commodity Dependent social groups and the second highest benefit to the Environmental Priority group.

**MKT Alternative:** This alternative would have the most road miles at the end of the fifth decade, 2,610 total miles, which is above the base year . It would benefit the Amenity Emphasis and Commodity Dependent social groups the most and would have the most negative impact on the Environmental Priority group's values and behaviors.

**ECR Alternative:** This alternative's effects would be similar to those of the CUR alternative, except it's total mileage would be 2,560, which is the third highest above the base year. It would have the third highest benefit to the Amenity Emphasis and Commodity Dependent social groups and the third highest negative impact to the values and behaviors of the Environmental Priority social group.

**Mitigations:** No mitigations were identified specific to fisheries.

## Site Conversion:

The Native American and Environmental Priority social groups are concerned about vegetational site conversion.

**Direct and Indirect Effects:** Native Americans view conversion of areas with cultural forest products as having negative effects on their lifestyles and behaviors. Negative impacts on the values and behaviors of the Environmental Priority group are tied to a conviction that site conversion causes a loss in biodiversity and disrupts natural forest processes. The PRF, OGR, and ECR alternatives do not allow site conversion. The CUR and MKT alternatives allow moderate amounts (about 100 acres a year) to be converted from hardwoods to conifers. These sites are basically areas where conifers have been removed by wildfire, and regeneration of the conifers has not succeed due to competition with hardwoods.

**CUR and MKT Alternatives:** These alternatives would allow moderate amounts of site conversion and would have a negative impact on the values and behaviors of both social groups.

**PRF, OGR, and ECR Alternatives:** These alternatives would not allow site conversion and would have a beneficial effect on the values and behaviors of both social groups.

**Mitigations:** The following mitigation measures would be taken as required by the Forest-wide standards and guidelines.

1. Hardwood stands not capable of supporting conifers would not be treated.

2. Hardwoods that exist as a stand component would be managed as a viable component of the stand.

3. Forest management practices that might have a negative effect on any social group's gathering activities would be screened by the appropriate staff and areas of traditional gathering analyzed in cooperation with the affected group and other resource specialists as necessary.

## Timber:

The allowable sale quantity (ASQ) is the amount of timber volume offered for sale from National Forest System lands. Two social groups are directly affected by the ASQ. The Commodity Dependent social group benefits from increased volumes offered. The Environmental Priority social group views timber harvesting generally as degrading the natural processes of the forest ecosystem.

The average annual timber sale volume for the 10-year period from 1981 through 1990 was 139 MMBF. Designation of the Smith River National Recreation Area and the Federal listing of the northern spotted owl under the Endangered Species Act dropped ASQ levels for 1991 and 1992 to 10.5 and 7.9 MMBF, respectively. This situation has caused a break in the historic timber volume contribution from Six Rivers National Forest to the primary zone of influence, representing only 1 percent contribution to the average annual timber harvest of the primary zone of influence, as opposed to a historic contribution of 15 percent over the past two decades. Timber volume harvested for 1991 was 91.7 MMBF and for 1992 was 68.6 MMBF. There is currently 78.3 MMBF under contract, to two timber operators.

**Direct and Indirect Effects:** Some effects of the drop in ASQ have already occurred. The major effects of the drop in ASQ for 1991 and 1992 will be felt within the next few years. All alternatives represent a decrease from the ASQ of the 1989 base year, which was set at 170 MMBF by an agreement between Six Rivers National Forest and the Sierra Club, until a Forest Land and Resource Management Plan is completed (See Timber Management section, Chapter

3). This is viewed as a beneficial effect to the values and behaviors of the Environmental Priority social group and a negative impact to the Commodity Dependent social group's lifestyle.

The drop in ASQ and timber harvest, along with the accompanying drop in acres open to full multiple use and accessible, is expected to have moderate effects on both the economic and social environments in terms of jobs, attitudes, lifestyles, behaviors, and community cohesion; these effects will be felt by all members of the communities within the primary zone of influence, not just those in the Commodity Dependent group. The major effects will be felt by small operators and sawmills that do not own their own timber lands and are, therefore, dependent on the Forest Service and small private timber land owners for harvest volume. Perhaps the greatest effect of the drop in ASQ will be felt by the counties that receive 25 percent funds. Table IV-14 shows the Forest's annual average ASQ under each alternative as a percentage contribution to the projected average timber harvest (1,100 MMBF) in the PZI, and as a percentage decline from the past 20 year average contribution (15 percent) to the PZI.

**Table IV-14. ASQ Contribution to PZI Timber Harvest.**

| Alternative | ASQ (MMBF) | Percent of PZI Timber Harvest | Percent Decline of contribution to PZI Harvest |
|---|---|---|---|
| CUR | 67.0 | 6.1 | 59 |
| PRF | 15.5 | 1.4 | 91 |
| OGR | 26.6 | 2.4 | 84 |
| MKT | 95.0 | 8.6 | 42 |
| ECR | 11.6 | 1.1 | 93 |

**CUR Alternative:** This alternative would have the second lowest negative impact to the values and behaviors of the Commodity Dependent social group and the second highest negative impact to the values and behaviors of the Environmental Priority social group.

**PRF Alternative:** This alternative would have the second highest negative impact to the values and behaviors of the Commodity Dependent social group and the second lowest negative impact to the values and behaviors of the Environmental Priority social group.

**OGR Alternative:** This alternative would have the third highest negative impact to the values and behaviors of the Commodity Dependent social group and the third highest negative impact to the values and behaviors of the Environmental Priority social group.

**MKT Alternative:** This alternative would have the lowest negative impact to the values and behaviors of the Commodity Dependent social group, and the highest negative impact to the values and behaviors of the Environmental Priority social group.

**ECR Alternative:** This alternative would have the highest negative impact to the values and behaviors of the Commodity Dependent social group, and the lowest negative impact to the values and behaviors of the Environmental Priority social group.

**Mitigations:** The following would be done under all alternatives:

1. The Forest would continue to work with communities to help diversify the local economies and find alternative uses of industrial sites such as the Simpson pulp mill.

2. Promote small timber sales, projects, and set asides for small or disadvantaged businesses.

Also see community stability and cohesion in this section and the Economic section in this chapter.

## Trail system:

The trail system was identified as important to the values and behaviors of the Amenity Emphasis social group, especially hunters, OHV enthusiasts, wildlife watchers, fishermen, hikers, horsemen, and mountain bike enthusiasts.

**Direct and Indirect Effects:** The rating of the alternatives is based on the total miles of trails on the Forest and the number of miles of trails reconstructed and maintained. All alternatives would increase miles of trail over the 1989 base year total of 220 miles of trail. All alternatives would also increase the miles of trails reconstructed and maintained over the base year. This would represent an overall benefit to the values and behaviors of the Amenity Emphasis social group for both the short and long term. Table IV-15 compares the total miles of trail at the end of the first and fifth decades by alternative.

**Table IV-15. Miles of Trail.**

| Alternative | Decade 1 | Decade 5 |
|---|---|---|
| CUR | 260 | 313 |
| PRF | 284 | 374 |
| OGR | 284 | 374 |
| MKT | 260 | 313 |
| ECR | 260 | 313 |

**CUR, MKT, and ECR Alternatives:** These alternatives would have the lowest beneficial effect to the values and behaviors of the Amenity Emphasis social group in relation to trails.

**PRF and OGR Alternatives:** These alternatives would have the highest beneficial effect to the values and behaviors of the Amenity Emphasis social group in relation to trails.

**Mitigations:** No mitigations were identified relative to the trail system.

## Visual Quality:

Visual quality was identified as a concern by three social groups: Native American, Amenity Emphasis, and Environmental Priority groups. All three social groups felt that a natural or near natural appearing National Forest was important to their values and behaviors. The overall rating system for visual quality is the Visual Quality Index (VQI). This system is used to measure and compare the impacts of the different management regimes of the alternatives and the base year (see Visual Resource Management section in this chapter for a discussion of the Visual Quality Index and Existing Visual Condition). The base year has an Existing Visual Condition (EVC) of 50.8, and the limits are: (1) if the Forest is managed completely in the lowest visual condition (Maximum Modification), the VQI is 31.0; (2) if the Forest is managed in the highest visual condition (Preservation), the VQI is 69.0.

**Direct and Indirect Effects:** All alternatives represent an increase in Visual Condition over the 1989 base year. This is considered a beneficial effect to the values and behaviors of all three social groups for both the short and long term. Table IV-16 compares the VQI for the alternatives through the fifth decade.

**Table IV-16. Visual Quality Index.**

| Alternative | 5th decade |
|---|---|
| CUR | 58.9 |
| PRF | 62.9 |
| OGR | 62.7 |
| MKT | 58.8 |
| ECR | 61.0 |

**CUR Alternative:** This alternative would have the second lowest beneficial effect to the values and behaviors of the three social groups in relation to visual quality.

**PRF Alternative:** This alternative would have the highest beneficial effect to the values and behaviors of the three social groups in relation to visual quality.

**OGR Alternative:** This alternative would have the second highest beneficial effect to the values and behaviors of the three social groups in relation to visual quality.

**MKT Alternative:** This alternative would have the lowest beneficial effect to the values and behaviors of the three social groups in relation to visual quality.

**ECR Alternative:** This alternative would have the third highest beneficial effect to the values and behaviors of the three social groups in relation to visual quality.

**Mitigations:** No mitigations were identified relative to visual quality.

## Water Quality:

Water quality was identified as a concern by all the social groups as important to their values and behaviors.

**Direct and Indirect Effects:** Overall water quality is evaluated by the amount of ground disturbing activities that take place in an alternative over time. These ground disturbing activities are road building, timber harvesting, grazing, mining, and fire management. Equivalent road acres (ERAs) were used in this EIS as part of the cumulative effects

methodology to arrive at the percentage of the threshold of concern (see Water section). The higher the percentage is, the greater the potential for impact is. The 1989 base year threshold of concern is 51 percent. Table IV-17 compares the average percent of thresholds of concern for each decade by alternative. All alternatives are below the base year, except that the MKT alternative in the second decade equals the base year. All alternatives are seen as having beneficial effects to water quality.

**Table IV-17. Percent Thresholds of Concern.**

| | Decade | | | | |
|---|---|---|---|---|---|
| **Alternative** | **1** | **2** | **3** | **4** | **5** |
| CUR | 49 | 48 | 49 | 49 | 50 |
| PRF | 45 | 43 | 42 | 42 | 42 |
| OGR | 47 | 45 | 44 | 45 | 45 |
| MKT | 49 | 51 | 50 | 49 | 49 |
| ECR | 48 | 47 | 46 | 46 | 46 |

**CUR Alternative:** This alternative would have the second lowest beneficial effect to the values and behaviors of all three social groups in relation to water quality.

**PRF Alternative:** This alternative would have the highest beneficial effect to the values and behaviors of all three social groups in relation to water quality.

**OGR Alternative:** This alternative would have the second highest beneficial effect to the values and behaviors of all three social groups in relation to water quality.

**MKT Alternative:** This alternative would have the lowest beneficial effect to the values and behaviors of all three social groups in relation to water quality.

**ECR Alternative:** This alternative would have the third highest beneficial effect to the values and behaviors of all three social groups in relation to water quality.

# ECONOMIC

## Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic stability of local communities?

The economic consequences of implementing the alternatives presented in this FEIS can be measured in several ways. As indicated in Chapter 3, the Forest affects the health of the local economy by supplying outputs and budget expenditures, and by contributing to county revenues. Additionally, Forest outputs and expenditures generate employment and income throughout Humboldt, Del Norte, and Trinity counties (the primary zone of influence). These factors, as well as present net value (PNV), will be used to evaluate economic consequences.

The consequences of the alternatives are expressed in terms of average annual outputs, costs, and benefits and compared to 1989 base year levels. All values are expressed in 1989 dollars as per Regional direction. Consequences are presented in a combined table and text format. Tables are used to present output, cost and benefit information for decades 1 through 5. Text focuses on consequences in decade 1 with reference to decades 2 through 5 where appropriate. Tables II-17, II-18, II-19, and II-20 in Chapter 2 provide a complete listing of the economic consequences for each decade.

## Framework For Analysis And Assumptions:

**Forest Outputs:** In Chapter 3, timber, recreation, fisheries, and range were identified as the four primary Forest outputs that contribute to the health of the local economy. Output levels, program costs, and net benefits will be presented for the first five decades. Net benefit is equal to the total benefit (market and/or non-market) of a given level of output less the Forest's cost of producing that output. Unit values and costs used in the analysis process are presented in FEIS Appendix B, Tables B-2, B-3, and B-4.

Timber program outputs are compared to the base year allowable sale quantity (ASQ), sale volume, and percent of total projected harvest of 1,100 MMBF in the primary zone of influence (PZI). The change in private harvest levels necessary to maintain the total harvest is also noted (See FEIS Appendix J, The Regional Timber Supply-Demand Situation in California). Recreation outputs are compared to base year recreation visitor days (RVDs). Fisheries outputs are compared to base year angler days (ADs) for sport fishing. Range outputs are compared to base year animal months (AMs).

**Forest Expenditures:** Forest expenditures represent the cost of administering the Forest and producing the desired mix of goods and services. Forest expenditures are funded through appropriated dollars, activity-generated funds such as KV, and monies from other state and federal agencies designated for specific projects. For the purpose of comparison, total projected Forest expenditures are presented.

**Employment and Income:** One way to measure the effect of the alternatives on the local economy is to examine the level of employment and personal income generated by Forest management activities and outputs. The four primary Forest outputs, as well as Forest expenditures, contribute to employment and income within the primary zone of influence. Employment is expressed in the number of person-years; a person-year is defined as 2,087 working hours by one person working year round, or by several persons working part time or seasonally. Personal income estimates include the total of wages and salaries, and proprietor's income and rents, and is directly proportional to employment levels. The analysis of this economic indicator includes the following assumptions:

1. Timber outputs generate 11.2 jobs per MMBF. Based on 1989 harvest and employment levels, 6 jobs per MMBF are considered direct timber employment in logging, processing in sawmills and planing mills, other wood products, and pulp and paper production. The remaining 5.2 jobs per MMBF are considered timber indirect or induced employment within the other major industry sectors that arise as a result of direct timber employment. While including all industry sectors, it is assumed that a majority of the timber indirect employment is within the transportation, services, and trade sectors.

2. Recreation generates 400 jobs per million RVDs, and hunting generates 400 jobs per million wildlife and fish user days (WFUDs).

3. Fisheries outputs generate 125 jobs per 100,000 sport fishing angler days.

4. Range outputs generate 66 jobs per 100,000 animal months.

5. Forest expenditures generate 30 jobs per million dollars (including Forest employment).

6. Each job or person-year represents an average personal income of $27,736 per year.

**Revenues to Counties:** The Forest influences county revenues directly by receipt sharing and indirectly through timber yield taxes. Humboldt, Del Norte, Trinity, and Siskiyou counties receive 25 percent of total annual Forest receipts distributed according to the acres of Forest in each county. Total forest receipts, or gross returns to the Federal Treasury, include cash receipts for timber, recreation, range, minerals, power, and special land uses. The counties also receive yield tax revenues generated by harvesting Forest timber. Timber yield taxes are paid by the purchaser at a rate of 2.9 percent of assigned timber value. The California State Board of Equalization, Timber Tax Division, assigns average stumpage values based on species, size, and harvesting system that may differ from the timber selling values used in the analysis process. Therefore, the yield tax values presented represent an approximation of the revenues to be generated, providing a basis for relative comparison of the alternatives.

**Present Net Value:** Total PNV is a measure of relative economic efficiency. It is defined as the sum of discounted benefits (both market and non-market) less the sum of discounted costs over 150 years. The alternative that produces the highest PNV is the most economically efficient solution. The reduction of PNV in any alternative as compared to the most economically efficient solution is the economic trade-off, or opportunity cost, of achieving that alternative. Also presented in this section is a “cash” PNV for each alternative. This PNV is defined as the sum of discounted Forest receipts less the sum of discounted costs over 150 years. The purpose of this measure is to determine the degree to which Forest receipts cover the cost of producing the desired mix of goods and services in each alternative. For both forms of PNV, the overall Forest PNV will be presented along with the PNV of the timber, recreation, fisheries, range, minerals, and land and power programs. These programs have been identified as being important to the local economy and/or generating Forest receipts.

## Consequences Common to all Alternatives

Consequences common to all alternatives include the cumulative effects of changes in timber, recreation, and fisheries outputs, and changes in local employment and income. While the effects of these changes in Forest programs can be quantified, it is difficult to quantify the total effect when combined with the future actions of state, local, and private entities which are unknown at this time. Therefore, the cumulative effects listed below are necessarily qualitative in nature, indicating the directions of changes that are likely to occur in the future.

**Forest Outputs:**

**Timber:** All alternatives would result in a reduction in ASQ, which should increase competition for forest products among timber purchasers. In order to maintain supply levels in the PZI, private industrial and non-industrial owners would have to harvest more timber. Private landowners, however, are experiencing difficulty in getting timber harvest plans approved by the state because of the current controversy surrounding wildlife management, and recent legal constraints which extend across land ownership divisions. The likely result is a continued decline in total timber harvest in the PZI. Competition for a shrinking supply of timber would increase timber prices, which may result in the failure of smaller, less financially stable companies that depend to some degree on Forest timber. Effects would be more severe in the first decade until the local economy adjusts to the new level of outputs and competition stabilizes.

Reduced public and private harvests in the PZI reflect an ongoing trend of declining timber supplies in the western United States. The western states, in particular Oregon, Washington, and California, are the primary domestic producers of sawtimber for the nation. Timber supply levels from this region are expected to continue decreasing as land management policies continue to shift from a resource utilization to amenity and/or protection emphasis. This would lead to an overall decrease in National domestic sawtimber supplies and an increase in price, as the demand for housing and business construction continues to grow along with the nation’s population. A probable result is an increased reliance on imported timber from Canada and other nations, which could fill part or all of the supply gap and hold prices down. A second, and likely concurrent effect, would be the substitution of other materials, such as steel and plastic, in the

construction industry as the price of timber approaches or surpasses the prices of these materials.

**Recreation:** Increases in Forest recreational use, when combined with efforts at the city, county, and state levels to increase non-local tourism should have a positive impact on tourism in the PZI. The greatest benefit would occur to those firms and individuals employed in the retail trade and services sectors that provide both local and non-local recreationists with necessities such as gas, food, lodging, and equipment. Increased recreational activity may also offset business losses in small communities within or adjacent to the Forest boundary that have traditionally relied on the business from timber firms and their employees.

**Fisheries:** State and private hatcheries and habitat improvement programs have the potential to increase the harvest available to commercial and sport fisheries beyond the increases that would be provided by the Forest fisheries and habitat improvement programs. This should have a positive impact on commercial fisheries by increasing employment, provided that harvest limits do not become more restrictive. Increases in sport fishing opportunities should draw more tourism to the area and benefit local businesses in the retail trade and services sectors.

**Employment and Income:** All alternatives would result in a reduction in timber related employment generated by Forest timber outputs. Other factors, such as declining private harvest levels, mill automation, and mill closures would result in an even greater reduction of timber related employment in the PZI. Projections of employment changes over the next 50 years indicate that the recovery of these timber jobs is not likely to occur.

Anticipated reductions in timber employment would be offset to some degree by increases in fisheries, recreation, and Forest expenditure related employment, but not enough to offset the effects that will be felt in the direct and indirect timber sectors. In addition, job gains in these other sectors are not likely to be filled by people displaced from the timber sector. Studies have indicated that people involved in the timber industry are likely to have difficulty finding alternate employment. While their skills are specialized within their field, they are not easily transferable to other jobs. Another barrier to seeking alternate employment is economic in nature: few people will choose to switch from a high paying resource extraction or manufacturing job to a relatively low paying service industry job. For many mill workers, transferring their manufacturing skills to other jobs would often require them to go to urban areas since there are few manufacturing jobs in the area that are not timber related.

With the loss of jobs in the timber industry can be expected decreases in other sectors of the economy that are connected with the timber industry, such as suppliers of equipment and materials, or places where industry workers dispose of their personal income. This kind of secondary effect would be more pronounced in the smaller towns dispersed throughout the primary and secondary zones of influence, where overall dependence on timber production as an economic base is greater.

No other cumulative consequences have been identified that are either common to all alternatives or specific to any given alternative.

## Mitigations Common to All Alternatives

The mitigations presented here represent ways by which the Forest could assist local communities in mitigating the effects of reduced timber supply and employment on the local economy. Please note that these mitigations differ from those for biological resources in that they are not a required aspect of management. Furthermore, the ability of the Forest to employ these mitigations may be affected by Congressional decisions or Forest Service policy and direction.

1. Emphasize smaller-sized sales in the timber program. This would increase the ability of smaller scale purchasers to meet the obligations of Forest timber sale contracts and would make them more competitive in the timber market, without excluding larger companies from bidding for sales. In addition, the Small Business Administration (SBA) program is already in place to assist small businesses in competing for timber sale contracts. The SBA set-aside program guarantees that 50 percent of all volume offered from Six Rivers lands will be available exclusively to small business operators, ensuring an equitable distribution of wood resources between small and large companies. This prevents smaller companies from being out-competed in the timber market by larger, more financially fluid companies.

2. Provide economic diversification assistance to local communities that are eligible for such aid under Subtitle G of the 1990 Farm Bill. This rural development package, expanded upon in the Chief's Strategic Plan for the 90s, directs the Forest Service, the Department of Agriculture, and State governments to cooperate with local rural authorities to develop economic diversification projects. This initiative allows the Forest to spend up to five percent of its income from timber receipts and user fees to provide technical assistance to local development officials. The Forest Service also has the authority to provide loans to communities to help implement rural development plans. Eligible communities could include, but are not limited to, Hoopa Valley, all of Trinity county, and the city of Fortuna. For further information regarding this initiative, see "A Strategic Plan for the 90s" and 1990 Farm Bill, Title 23, Subtitle G; both are on file at Six Rivers National Forest.

3. Continue to emphasize the "Jobs in the Woods" program while funding is available. This program, funded by the President's Plan, places emphasis on creating employment in local communities through restoration projects. In addition, another goal of the program is to assist local workers in making the transition from timber related jobs to other types of work by transferring existing skills, developing new skills, and training members of local communities to compete successfully for Forest Service contracts.

4. Expand the Special Forest Products program on the Forest. This program provides an opportunity for individuals and local communities to develop a source of income from National Forest resources other than timber.

No other mitigations either common to all alternatives or specific to any given alternative were identified.

## Consequences Specific To An Alternative

Tables IV-18 through IV-25 compare present average annual outputs and values, forest expenditures, employment and income, 25 percent fund and yield tax revenues, and present net value by alternative for each decade. All values are expressed in terms of 1989 dollars to facilitate comparison of the alternatives. Consequences are summarized by alternative following the tables.

**Table IV-18. Average Annual Timber Output and Value**

| | | Decade | | | | |
|---|---|---|---|---|---|---|
| **Alternative** | **Units** | **1** | **2** | **3** | **4** | **5** |
| **CUR** | | | | | | |
| Output | MMBF | 67.0 | 67.0 | 67.0 | 67.0 | 67.0 |
| Total Benefit | MM $ | 25.1 | 28.6 | 32.5 | 37.0 | 42.1 |
| Program Cost | MM $ | 10.5 | 9.0 | 10.2 | 8.9 | 9.7 |
| Net Benefit | MM $ | 14.6 | 19.6 | 22.3 | 28.1 | 32.4 |
| **PRF** | | | | | | |
| Output | MMBF | 15.5 | 15.5 | 15.5 | 15.5 | 15.5 |
| Total Benefit | MM $ | 5.5 | 6.3 | 7.1 | 8.2 | 9.3 |
| Program Cost | MM $ | 2.3 | 2.3 | 2.3 | 2.3 | 2.3 |
| Net Benefit | MM $ | 3.2 | 4.0 | 4.8 | 5.9 | 7.0 |
| **OGR** | | | | | | |
| Output | MMBF | 26.5 | 26.5 | 26.5 | 26.5 | 26.5 |
| Total Benefit | MM $ | 10.0 | 11.4 | 13.0 | 14.8 | 16.8 |
| Program Cost | MM $ | 3.7 | 3.8 | 3.8 | 3.4 | 3.6 |
| Net Benefit | MM $ | 6.3 | 7.6 | 9.2 | 11.4 | 13.2 |
| **MKT** | | | | | | |
| Output | MMBF | 95.0 | 95.0 | 95.0 | 95.0 | 95.0 |
| Total Benefit | MM $ | 35.6 | 40.5 | 46.1 | 52.4 | 59.7 |
| Program Cost | MM $ | 12.2 | 15.6 | 11.9 | 12.0 | 12.3 |
| Net Benefit | MM $ | 23.4 | 24.9 | 34.2 | 40.0 | 47.4 |
| **ECR** | | | | | | |
| Output | MMBF | 11.6 | 11.6 | 11.6 | 11.6 | 11.6 |
| Total Benefit | MM $ | 4.3 | 4.9 | 5.6 | 6.4 | 7.3 |
| Program Cost | MM $ | 3.7 | 3.4 | 3.2 | 3.2 | 3.2 |
| Net Benefit | MM $ | 0.6 | 1.5 | 2.4 | 3.2 | 4.1 |

**Table IV-19. Average Annual Recreation Output and Value**

| | | Decade | | | | |
|---|---|---|---|---|---|---|
| **Alternative** | **Units** | **1** | **2** | **3** | **4** | **5** |
| **CUR, MKT and ECR** | | | | | | |
| Output | MRVD[1] | 904 | 1,001 | 1,091 | 1,171 | 1,251 |
| Total Benefit | MM $ | 23.2 | 26.3 | 29.0 | 31.8 | 34.6 |
| Program Cost | MM $ | 1.1 | 1.1 | 1.2 | 1.2 | 1.2 |
| Net Benefit | MM $ | 22.2 | 25.2 | 27.8 | 30.6 | 33.4 |
| **PRF and OGR** | | | | | | |
| Output | MRVD[1] | 976 | 1,093 | 1,178 | 1,263 | 1,358 |
| Total Benefit | MM $ | 25.2 | 28.5 | 31.4 | 34.4 | 37.5 |
| Program Cost | MM $ | 1.9 | 2.0 | 2.1 | 2.2 | 2.2 |
| Net Benefits | MM $ | 23.3 | 26.5 | 29.3 | 32.2 | 35.3 |

[1] Includes dispersed, developed, and wilderness RVDs and hunting WFUDs

**Table IV-20. Average Annual Fisheries Output and Value**

| Alternative | Units | Decade 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **All Alternatives** | | | | | | |
| Sport Fishing | M AD | 7.3 | 8.1 | 8.8 | 9.5 | 10.2 |
| Total Benefit | M $ | 170.4 | 194.9 | 215.3 | 236.2 | 257.8 |
| **Cost (MM $)** | **Net Benefit (MM $)** | | | | | |
| CUR | 1.7 | -1.5 | -1.5 | -1.4 | -1.4 | -1.4 |
| PRF | 1.4 | -1.3 | -1.3 | -1.2 | -1.2 | -1.2 |
| OGR | 1.5 | -1.3 | -1.3 | -1.3 | -1.2 | -1.2 |
| MKT | 1.8 | -1.6 | -1.6 | -1.6 | -1.6 | -1.5 |
| ECR | 1.4 | -1.2 | -1.2 | -1.2 | -1.2 | -1.1 |

**Table IV-21. Average Annual Range Output and Value**

| Alternative | Units | Decade 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **CUR** | | | | | | |
| Output | AM | 6609 | 7738 | 8866 | 9995 | 11124 |
| Total Benefit | M $ | 33.8 | 41.2 | 49.1 | 57.8 | 66.9 |
| Program Cost | M $ | 190.7 | 202.6 | 214.4 | 226.2 | 238.1 |
| Net Benefit | M $ | -156.9 | -161.4 | -165.3 | -168.4 | -171.2 |
| **PRF** | | | | | | |
| Output | AM | 6609 | 6609 | 6609 | 6609 | 6609 |
| Total Benefit | M $ | 33.8 | 35.1 | 36.6 | 38.1 | 39.6 |
| Program Cost | M $ | 129.0 | 129.0 | 129.0 | 129.0 | 129.0 |
| Net Benefit | M $ | -95.2 | -93.9 | -92.4 | -90.9 | -89.4 |
| **OGR** | | | | | | |
| Output | AM | 6609 | 5838 | 5838 | 5838 | 5838 |
| Total Benefit | M $ | 33.8 | 31.0 | 32.3 | 33.6 | 35.0 |
| Program Cost | M $ | 142.1 | 134.4 | 134.4 | 134.4 | 134.4 |
| Net Benefit | M $ | -108.3 | -103.4 | -102.1 | -100.8 | -99.4 |
| **MKT** | | | | | | |
| Output | AM | 6609 | 9313 | 12016 | 14720 | 17424 |
| Total Benefit | M $ | 33.8 | 49.5 | 66.5 | 84.8 | 104.4 |
| Program Cost | M $ | 224.3 | 252.7 | 281.0 | 309.4 | 337.8 |
| Net Benefit | M $ | -190.5 | -203.2 | -214.5 | -224.6 | -233.4 |
| **ECR** | | | | | | |
| Output | AM | 6609 | 0 | 0 | 0 | 0 |
| Total Benefit | M $ | 33.8 | 0 | 0 | 0 | 0 |
| Program Cost | M $ | 124.2 | 0 | 0 | 0 | 0 |
| Net Benefit | M $ | -90.4 | 0 | 0 | 0 | 0 |

**Table IV-22. Average Annual Forest Expenditures[1/]**

| Alternative | Units | Decade 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| CUR | MM $ | 23.7 | 22.6 | 24.0 | 22.8 | 23.7 |
| PRF | MM $ | 16.4 | 17.0 | 17.1 | 17.2 | 17.3 |
| OGR | MM $ | 17.4 | 18.1 | 18.5 | 18.1 | 18.4 |
| MKT | MM $ | 25.6 | 29.4 | 25.6 | 25.8 | 26.2 |
| ECR | MM $ | 16.2 | 16.6 | 17.0 | 17.1 | 17.1 |

1/ Expenditures include the Forest budget, purchaser road credit applied against timber receipts, and other state and federal agency monies received by the Forest for fish and wildlife, fire, and human resources programs.

**Table IV-23. Average Annual Employment and Income**

| Employment (person-years) | Base Year | Decade 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **CUR** | | | | | | |
| Timber | 1,340 | 750 | 750 | 750 | 750 | 750 |
| Range | 5 | 5 | 5 | 6 | 7 | 8 |
| Fisheries | 11 | 9 | 10 | 11 | 11 | 12 |
| Recreation | 311 | 362 | 400 | 436 | 468 | 500 |
| Forest Expenditures | 561 | 709 | 679 | 720 | 682 | 710 |
| Total Employment | 2,257 | 1,835 | 1,844 | 1,923 | 1,918 | 1,980 |
| Personal Income (MM $) | 62.6 | 50.9 | 51.2 | 53.3 | 53.2 | 54.9 |
| **PRF** | | | | | | |
| Timber | 1,340 | 174 | 174 | 174 | 174 | 174 |
| Range | 5 | 5 | 5 | 5 | 5 | 5 |
| Fisheries | 11 | 9 | 10 | 11 | 11 | 12 |
| Recreation | 311 | 392 | 437 | 471 | 505 | 543 |
| Forest Expenditures | 561 | 490 | 507 | 512 | 517 | 517 |
| Total Employment | 2,257 | 1,070 | 1,133 | 1,173 | 1,212 | 1,251 |
| Personal Income (MM $) | 62.6 | 29.7 | 31.4 | 32.5 | 33.6 | 34.7 |
| **OGR** | | | | | | |
| Timber | 1,340 | 297 | 297 | 297 | 297 | 297 |
| Range | 5 | 5 | 4 | 4 | 4 | 4 |
| Fisheries | 11 | 9 | 10 | 11 | 11 | 12 |
| Recreation | 311 | 392 | 437 | 471 | 505 | 543 |
| Forest Expenditures | 561 | 519 | 542 | 555 | 545 | 551 |
| Total Employment | 2,257 | 1,222 | 1,290 | 1,338 | 1,362 | 1,407 |
| Personal Income (MM $) | 62.6 | 33.9 | 35.8 | 37.1 | 37.8 | 39.0 |
| **MKT** | | | | | | |
| Timber | 1,340 | 1,064 | 1,064 | 1,064 | 1,064 | 1,064 |
| Range | 5 | 5 | 7 | 8 | 10 | 12 |
| Fisheries | 11 | 9 | 10 | 11 | 11 | 12 |
| Recreation | 311 | 362 | 400 | 436 | 468 | 500 |
| Forest Expenditures | 561 | 767 | 883 | 768 | 774 | 786 |
| Total Employment | 2,257 | 2,207 | 2,364 | 2,287 | 2,327 | 2,374 |
| Personal I ncome (MM $) | 62.6 | 61.2 | 65.5 | 63.4 | 64.5 | 65.8 |
| **ECR** | | | | | | |
| Timber | 1,340 | 130 | 130 | 130 | 130 | 130 |
| Range | 5 | 5 | 0 | 0 | 0 | 0 |
| Fisheries | 11 | 9 | 10 | 11 | 11 | 12 |
| Recreation | 311 | 362 | 400 | 436 | 468 | 500 |
| Forest Expenditures | 561 | 484 | 500 | 508 | 512 | 513 |
| Total Employment | 2,257 | 990 | 1,040 | 1,085 | 1,121 | 1,155 |
| Personal Income (MM $) | 62.6 | 27.4 | 28.8 | 30.1 | 31.1 | 32.0 |

**Table IV-24. Average Annual 25% Fund and Yield Tax Revenues**

| Alternative | Units | Decade 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| **CUR** | | | | | | |
| Gross Returns to Treasury | MM $ | 25.2 | 28.7 | 32.6 | 37.1 | 42.2 |
| 25% Receipts to Counties | MM $ | 6.3 | 7.2 | 8.2 | 9.3 | 10.5 |
| Yield Tax Revenues | M $ | 728.0 | 828.4 | 942.6 | 1072.6 | 1220.4 |
| **PRF** | | | | | | |
| Gross Returns to Treasury | MM $ | 5.6 | 6.4 | 7.3 | 8.3 | 9.4 |
| 25% Receipts to Counties | MM $ | 1.4 | 1.6 | 1.8 | 2.1 | 2.4 |
| Yield Tax Revenues | M $ | 159.8 | 181.9 | 206.9 | 237.0 | 269.7 |
| **OGR** | | | | | | |
| Gross Returns to Treasury | MM $ | 10.1 | 11.5 | 13.1 | 14.9 | 17.0 |
| 25% Receipts to Counties | MM $ | 2.5 | 2.9 | 3.3 | 3.7 | 4.2 |
| Yield Tax Revenues | M $ | 290.5 | 330.6 | 376.1 | 428.0 | 487.0 |
| **MKT** | | | | | | |
| Gross Returns to Treasury | MM $ | 35.7 | 40.6 | 46.2 | 52.6 | 59.8 |
| 25% Receipts to Counties | MM $ | 8.9 | 10.2 | 11.5 | 13.1 | 14.9 |
| Yield Tax Revenues | M $ | 1032.3 | 1174.6 | 1336.6 | 1520.8 | 1730.5 |
| **ECR** | | | | | | |
| Gross Returns to Treasury | MM $ | 4.5 | 5.1 | 5.8 | 6.5 | 7.4 |
| 25% Receipts to Counties | MM $ | 1.1 | 1.3 | 1.4 | 1.6 | 1.9 |
| Yield Tax Revenues | M $ | 126.0 | 143.4 | 163.2 | 185.7 | 211.3 |

**Table IV-25. PNV and Its Primary Components**

| Units | CUR | PRF | OGR | MKT | ECR |
|---|---|---|---|---|---|
| | Alternatives | | | | |
| Total PNV | | | | | |
| MM $ | 930.9 | 526.3 | 640.1 | 1,181.3 | 437.9 |
| Components | | | | | |
| MM $ | | | | | |
| Timber | 556.4 | 119.3 | 226.8 | 809.0 | 57.6 |
| Recreation | 680.1 | 716.4 | 716.4 | 680.1 | 680.1 |
| Fisheries | -36.7 | -30.7 | -32.0 | -40.0 | -30.4 |
| Range | -4.1 | -2.3 | -2.6 | -5.3 | -.7 |
| Minerals | -2.8 | -2.8 | -2.8 | -2.8 | -2.8 |
| Land/Power | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 |
| Cash PNV | | | | | |
| MM $ | 217.3 | -245.4 | -131.6 | 467.4 | -275.2 |
| Components | | | | | |
| MM $ | | | | | |
| Timber | 556.4 | 119.3 | 226.8 | 809.0 | 57.6 |
| Recreation | -27.6 | -49.4 | -49.4 | -27.6 | -27.6 |
| Fisheries | -36.7 | -30.7 | -32.0 | -40.0 | -30.4 |
| Range | -4.8 | -2.9 | -3.1 | -6.2 | -.9 |
| Minerals | -2.9 | -2.9 | -2.9 | -2.9 | -2.9 |
| Land/Power | -4.0 | -4.0 | -4.0 | -4.0 | -4.0 |

## CUR Alternative

## Direct and Indirect Effects:

**Forest Outputs:** Refer to Tables IV-18 through IV-21 for projected outputs, costs, and benefits for decades 1 through 5.

**Timber:** ASQ would be 67 MMBF; 39 percent of base year ASQ (170 MMBF) and 56 percent of base year sale volume (119.7 MMBF). This ASQ would be 6.1 percent of timber harvested in the PZI as compared to a base year contribution of 10.9 percent. Private industrial and non-industrial timber owners would need to harvest an additional 10 MMBF to maintain the total projected harvest of 1,100 MMBF in the PZI.

Program cost would range between $8.9 and $10.5 million over the first five decades. Differences are primarily due to the amount of timber related road construction and reconstruction that would be required each decade. Average program cost would be equivalent to that of the base year program at $9.6 million. The increase in cost relative to the decrease in program output would be due to a 79 percent increase per MBF in sale planning and preparation costs for other resource support and input.

Net benefit during the first decade would be $14.6 million as compared to $20.8 million in the base year. Net benefit would be comparable to that of the base year by the third decade and exceed it by $11.6 million in the fifth decade.

**Recreation:** Recreational use of the Forest would increase by 16 percent in the first decade to 904,000 RVDs and continue to increase at a rate of 6-8 percent per decade thereafter.

Program cost would range between $1.1 and $1.2 million over the first five decades, approximately two times greater than the base year cost of $0.6 million. Part of the increase in cost would be due to additional funding for the Smith River NRA and funding from the State Green Sticker program that has not been available in the past. The objective of the recreation program under this alternative would be to restore/ maintain existing recreational opportunities. Therefore, program costs would increase at approximately the same rate as the level of use.

Given projected increases in the value of various forms of recreation, the net benefit of this level of recreation management would be $22.2 million in the first decade, an increase of 17 percent over base year. Net benefit is projected to reach $33.4 million in the fifth decade.

**Fisheries:** Fisheries habitat improvement programs on the Forest are projected to yield a long-term increase in fish production for both sport and commercial fisheries. Sport fishing would decrease by 20 percent from an average of 9,088 to 7,270 angler days per year in the first decade, and slowly increase to 10,200 angler days per year in the fifth decade as fish populations are expected to increase over time with improved habitat. The effect of habitat improvement programs on the commercial fishing industry cannot be predicted.

Program cost would be $1.7 million in all decades, an increase of six percent over the base year cost of $1.6 million. The increase in cost would be due to an increase in KV collections from $1.95/MBF to $4.65/ MBF for fisheries improvement opportunities within timber sale areas. Net benefit in the first decade would be -$1.5 million, slightly less than the base year net benefit of -$1.4 million. Net benefit by the fifth decade would be equivalent to that of the base year.

**Range:** Range output in the first decade would be 6,609 animal months per year. Program cost would be $190,000, an increase of 57 percent over the base year cost of $121,300. Increase in cost would be due to KV collections of $1.20/MBF for range improvement opportunities within timber sale areas. Net benefit in the first decade would be -$156,900 as compared to base year net benefits of -$73,000. After the first decade, outputs would increase 10 to 20 percent per decade, reaching 11,124 animal months by the fifth decade. Program costs and net benefits in the fifth decade would be $238,000 and -$171,200, respectively.

**Forest Expenditures:** Refer to Table IV-22 for projected Forest expenditures for decades 1 through 5. Forest expenditures would remain fairly stable over the first five decades, ranging from $22.6 to $24.0 million. First decade expenditures would be $23.7 million, 27 percent higher than the base year level of $18.7 million. Timber program expenditures would increase by $0.9 million to $10.5 million. Other Forest program expenditures would increase by $4.2 million, or 46 percent over base year expenditures of $9.1 million, with most programs receiving an increase in non-timber related funding.

**Employment and Income:** Refer to Table IV-23 for projected employment and income for decades 1 through 5. Employment would be 1,835 person-years during the first decade, a reduction of 422 jobs, or 19 percent below base year levels. Timber related employment would account for almost 100 percent of the decrease with a reduction of 590 person-years. This is offset to some degree by an increase of 199 person-years in recreation, and Forest expenditure related employment. By the fifth decade, employment should grow to 1,980 person-years, or 88 percent of base year employment. The growth in employment would be in jobs generated by recreation, fisheries, range, and expenditure related jobs as timber jobs would not be recovered without an increase in Forest ASQ.

**County Revenues:** Refer to Table IV-24 for projected county revenues for decades 1 through 5. The 25 percent fund would average $6.3 million in the first decade, exceeding the base year of $5.9 million by 7 percent, and would reach $10.5 million by the fifth decade. Timber receipts would account for 99 percent of all Forest receipts. Timber yield tax returned to the counties would be $728,000 in the first decade, 80 percent of the base year level of $895,000. Yield taxes would continue to grow over time, exceeding the base year in the third decade at $942,000 and reaching $1.2 million in the fifth decade.

**PNV:** Refer to Table IV-25 for total PNV and PNV components. The CUR alternative would rank second in total PNV at $0.9 billion. The opportunity cost associated with implementing this alternative instead of the most economically efficient alternative would be $250.4 million. The “cash” PNV would be $217.3 million, indicating that Forest receipts could cover the cost of all Forest programs.

## PRF Alternative

## Direct and Indirect Effects:

**Forest Outputs:** Refer to Tables IV-18 through IV-21 for projected outputs, costs, and benefits for decades 1 through 5.

T**imber:** ASQ would be 15.5 MMBF; 9 percent of base year ASQ (170 MMBF) and 13 percent of base year sale volume (119.7 MMBF). This ASQ would be 1.4 percent of timber harvested in the PZI as compared to a base year contribution of 10.9 percent. Private industrial and non-industrial timber owners would need to harvest an additional 62 MMBF to maintain the total projected harvest of 1,100 MMBF in the PZI.

Program cost would average $2.3 million per year over the first 5 decades. Average program cost would be 24 percent of the base year cost of $9.6 million. However, sale preparation and planning costs per MBF would increase by 85 percent due to the increased complexity of vegetation management prescriptions and increased input from other resources.

Net benefit during the first decade would be $3.2 million as compared to $20.8 million in the base year. Net benefit would reach $7.0 million per year, approximately 34 percent of base year levels, by the fifth decade.

**Recreation:** Recreational use of the Forest would increase by 26 percent in the first decade to 976,000 RVDs and continue to increase at a rate of 6 to 8 percent per decade thereafter.

An objective of this alternative is to increase recreational opportunities on the Forest, which calls for a higher level of investment in recreational facilities and trails. Program cost would range between $1.9 and $2.2 million over the first five

decades, approximately three times greater than the base year cost of $0.6 million. Part of the increase in cost would be due to additional funding for the Smith River NRA and funding from the State Green Sticker program that has not been available in the past.

Given projected increases in the value of various forms of recreation, the net benefit of this level of recreation management would be $23.3 million in the first decade, an increase of 23 percent over base year. Net benefit is projected to reach $35.3 million in the fifth decade.

**Fisheries:** Fisheries outputs would be the same as the CUR alternative. Program cost would be $1.4 million in all decades, approximately 88 percent of the base year cost of $1.6 million. The decrease in program funding would be due to a reduction in total KV collections resulting from a reduced timber program. Net benefit in the first decade would be -$1.3 million, slightly greater than the base year net benefit of -$1.4 million. Net benefit would continue to increase and by the fifth decade reach -$1.2 million.

**Range:** Range output would remain the same in all decades at 6,609 animal months. Program cost would be $129,000 in all decades, an increase of 6 percent over the base year cost of $121,300. Increase in cost would be due to KV collections of $1.20/MBF for range improvement opportunities within timber sale areas. Net benefit in the first decade would be -$95,200 as compared to base year net benefits of -$73,000. Net benefit would continue to improve (become less negative) over time to -$89,400 in the fifth decade.

**Forest Expenditures:** Refer to Table IV-22 for projected Forest expenditures for decades 1 through 5. Forest expenditures would remain fairly stable over the first five decades, ranging from $16.4 to $17.3 million. First decade expenditures would be $16.4 million, 12 percent lower than the base year level of $18.7 million. Timber program expenditures would decrease by $7.3 million to $2.3 million. Other Forest program expenditures would increase by $5.0 million, or 55 percent over base year expenditures of $9.1 million, with most programs receiving an increase in non-timber related funding.

**Employment and Income:** Refer to Table IV-23 for projected employment and income for decades 1 through 5. Employment would be 1,070 person-years during the first decade, a reduction of 1,187 jobs, or 53 percent below base year levels. Timber related employment would account for approximately 94 percent of the reduction and employment related to Forest expenditures the remaining six percent. By the fifth decade, employment should grow to 1,251 person-years, or 55 percent of base year employment. The growth in employment would be in jobs generated by recreation, fisheries, and expenditure outputs as timber jobs could not be recovered without an increase in Forest ASQ.

**County Revenues:** Refer to Table IV-24 for projected county revenues for decades 1 through 5. The 25 percent Fund would average $1.4 million per year in the first decade, a 76 percent reduction from the base year level of $5.9 million. The Fund would grow to $2.4 million per year by the fifth decade, approximately 40 percent of base year. Timber yield tax returned to the counties would be $159,800 in the first decade, 18 percent of the base year level of $895,000. Yield taxes would continue to grow over time, reaching $269,700 in the fifth decade and not recover base year levels.

**PNV:** Refer to Table IV-25 for total PNV and PNV components. The PRF alternative would rank fourth in total PNV at $0.5 billion. The opportunity cost associated with implementing this alternative would be $655.0 million. The “cash” PNV would be -$245.4 million, indicating that Forest receipts would not cover the cost of all Forest programs.

## OGR Alternative

## Direct and Indirect Effects:

**Forest Outputs:** Refer to Tables IV-18 through IV-21 for projected outputs, costs, and benefits for decades 1 through 5.

**Timber:** ASQ would be 26.5 MMBF; 16 percent of base year ASQ (170 MMBF) and 22 percent of base year sale volume (119.7 MMBF). This ASQ would be 2.4 percent of timber harvested in the PZI as compared to a base year contribution of 10.9 percent. Private industrial and non-industrial timber owners would need to harvest an additional 51 MMBF to maintain the total projected harvest of 1,100 MMBF in the PZI.

Program cost would range between $3.4 and $3.8 million over the first five decades. Average program cost would be 38 percent of the base year cost of $9.6 million. Sale preparation and administration costs per MBF would increase by 69 percent due to increases in other resource support and input.

Net benefit during the first decade would be $6.3 million as compared to $20.8 million in the base year. Net benefit would increase to $13.2 million in the fifth decade, approximately 65 percent of base year level.

**Recreation:** Recreational outputs, costs, and benefits would be the same as in the PRF alternative.

**Fisheries:** Fisheries output would be the same as in the CUR alternative. Program cost would be $1.5 million in all decades, a decrease of 6 percent from the base year cost of $1.6 million. An increase in KV collections from $1.95/MBF to $4.65/MBF for fisheries improvement opportunities within timber sale areas would not be enough to offset a reduction in KV funding associated with a 78 percent reduction in ASQ. Net benefit in the first decade would be -$1.3 million, a small increase over -$1.4 million in the base year. Net benefit would continue to increase along with outputs to -$1.2 million by the fifth decade.

**Range:** Range output would be 6,609 animal months in the first decade, decreasing to 5,838 animal months in decades two through five. Program cost would be $142,100 in the first decade and $134,400 thereafter, an increase of 17 and 11 percent over the base year cost of $121,300. Increase in cost would be due to KV collections of $1.20/MBF for range improvement opportunities within timber sale areas. Net benefit in the first decade would be -$108,300 as compared to base year net benefits of -$73,000. Net benefit would continue to improve (become less negative) over time to -$99,400 in the fifth decade.

**Forest Expenditures:** Refer to Table IV-22 for projected Forest expenditures for decades 1 through 5. Forest expenditures would remain fairly stable over the first five decades, ranging from $17.4 to $18.5 million. First decade expenditures would be $17.4 million, 7 percent lower than the base year level of $18.7 million. Timber program expenditures would decrease by $5.9 million to $3.7 million. Other Forest program expenditures would increase by $4.6 million, or 50 percent over base year expenditures of $9.1 million, with most programs receiving an increase in non-timber related funding.

**Employment and Income:** Refer to Table IV-23 for projected employment and income for decades 1 through 5. Employment would be 1,222 person-years during the first decade, a reduction of 1,035 jobs, or 46 percent below base year levels. Timber related employment would be reduced by 1,043 person-years, and Forest expenditure related employment by 42 person-years. This is offset to some degree by an increase of 81 person-years in recreation related employment. By the fifth decade, employment should grow to 1,407 person-years, or 62 percent of base year employment. The growth in employment would primarily be in jobs generated by recreation outputs. Expenditure related employment would increase slightly but would still be 10 person-years less than the base year. Timber related employment would not be recovered without an increase in Forest ASQ.

**County Revenues:** Refer to Table IV-24 for projected county revenues for decades 1 through 5. The 25 percent Fund would average $2.5 million in the first decade, a reduction of 42 percent from the base year level of $5.9 million, and would reach 71 percent of the base year level at $4.2 million in the fifth decade. Timber receipts would account for 99 percent of all Forest receipts. Timber yield tax returned to the counties would be $290,500 in the first decade, 32 percent of the base year level of $895,000. Yield taxes would continue to grow over time, reaching $487,000, or 54 percent of the base year levels, in the fifth decade.

**PNV:** Refer to Table IV-25 for total PNV and PNV components. The OGR alternative would rank third in total PNV at $0.6 billion. The opportunity cost associated with implementing this alternative instead of the most economically efficient alternative would be $541.2 million. The “cash” PNV would be -$131.6 million, indicating that Forest receipts would not cover the cost of all Forest programs.

## MKT Alternative

## Direct and Indirect Effects:

**Forest Outputs:** Refer to Tables IV-18 through IV-21 for projected outputs, costs, and benefits for decades 1 through 5.

**Timber:** ASQ would be 95.0 MMBF; 56 percent of base year ASQ (170 MMBF) and 79 percent of base year sale volume (119.7 MMBF). This ASQ would be 8.6 percent of timber harvested in the PZI as compared to a base year contribution of 10.9 percent. Private industrial and non-industrial timber owners would have the option of reducing their harvest level by 18 MMBF and still maintain the total projected harvest of 1,100 MMBF in the PZI.

Program cost would average 12.2 million per year the first decade, increase to $15.6 million the second decade, then range between $11.9 and $12.3 million in decades 3 through 5. Differences are primarily due to the amount of timber related road construction and reconstruction that would be required each decade. Average program cost would be 33 percent greater than the base year cost of $9.6 million. The increase in cost would be due to a 68 percent increase in sale planning and preparation costs per MBF for other resource support and input.

Net benefit during the first decade would be $23.4 million, exceeding the base year net benefit of $20.8 million. Net benefit would be $47.4 million in the fifth decade.

**Recreation:** Recreational outputs, costs, and benefits would be the same as in the CUR alternative.

**Fisheries:** Fisheries output would be the same as in the CUR alternative. Program cost would be $1.8 million in all decades, an increase of 12 percent over the base year cost of $1.6 million. The increase in cost would be due to an increase in KV collections from $1.95/MBF to $4.65/MBF for fisheries improvement opportunities within timber sale areas. Net benefit in the first decade would be -$1.6 million, and would continue to increase along with outputs to -$1.5 million by the fifth decade.

**Range:** Range output would be 6,609 animal months in the first decade, increasing to 17,424 animal months by the fifth decade. Program cost would be $224,300 in the first decade, an increase of 85 percent over the base year cost of $121,300. Increase in cost would be due to KV collections of $1.20/MBF for range improvement opportunities within timber sale areas. Net benefit in the first decade would be -$190,500 as compared to base year net benefits of -$73,000. Program costs would increase through the fifth decade with outputs to $337,800. Net benefit would decrease over time to -$233,400 in the fifth decade.

**Forest Expenditures:** Refer to Table IV-22 for projected Forest expenditures for decades 1 through 5. Forest expenditures would remain fairly stable over the first five decades, ranging from $25.6 to $26.2 million, with the exception of the second decade, where expenditures would increase to $29.4 million due to a large amount of road reconstruction. First decade expenditures would be $25.6 million, 37 percent higher than the base year level of $18.7 million. Timber program expenditures would increase by $2.6 million to $12.2 million. Other Forest program expenditures would increase by $4.3 million, or 47 percent over base year expenditures of $9.1 million, with most programs receiving an increase in non-timber related funding.

**Employment and Income:** Refer to Table IV-23 for projected employment and income for decades 1 through 5. Employment would be 2,207 person-years during the first decade, a decrease of 50 jobs, or 98 percent of base year employment. Timber related employment would be reduced by 276 person-years. This would be offset by an increase of 257 person-years in recreation and expenditure related employment, with the greatest increase related to Forest expenditures. By the fifth decade, employment should grow to 2,374 person-years, or 105 percent of base year employment. The growth in employment would be in jobs generated by recreation, fisheries, range, and expenditure outputs as timber jobs could not be recovered without an increase in Forest ASQ.

**County Revenues:** Refer to Table IV-24 for projected county revenues for decades 1 through 5. The 25 percent Fund would average $8.9 million in the first decade, exceeding the base year of $5.9 million by 50 percent, and would reach $14.9 million by the fifth decade. Timber receipts would account for 99 percent of all Forest receipts. Timber yield tax returned to the counties would be $1,032,300 in the first decade, 115 percent of the base year level of $895,000. Yield taxes would continue to grow over time, reaching $1.7 million in the fifth decade.

**PNV:** Refer to Table IV-25 for total PNV and PNV components. The MKT alternative would rank first in total PNV at $1.18 billion, indicating it is the most economically efficient alternative. The “cash” PNV would be $467.4 million, indicating that Forest receipts would cover the cost of all Forest programs.

## ECR ALTERNATIVE

### Direct and Indirect Effects:

**Forest Outputs:** Refer to Tables IV-18 through IV-21 for projected outputs, costs, and benefits for decades 1 through 5.

**Timber:** ASQ would be 11.6 MMBF; 7 percent of base year ASQ (170 MMBF) and 10 percent of base year sale volume (119.7 MMBF). This ASQ would be 1.0 percent of timber harvested in the PZI as compared

to a base year contribution of 10.9 percent. Private industrial and non-industrial timber owners would need to harvest an additional 65 MMBF to maintain the total projected harvest of 1,100 MMBF in the PZI.

Program cost would begin at an average $3.7 million per year in the first decade, decreasing to $3.2 million by the third decade and stabilizing. Reductions in program cost over time are related to a slow reduction in road construction and reconstruction each decade. Average program cost would be 34 percent of the base year cost of $9.6 million.

Net benefit during the first decade would be $0.6 million as compared to $20.8 million in the base year. Net benefit would increase to $4.1 million in the fifth decade, approximately 20 percent of base year level.

**Recreation:** Recreational outputs, costs, and benefits would be the same as in the CUR Alternative.

**Fisheries:** Fisheries output would be the same as in the CUR alternative. Program cost would be $1.4 million in all decades, a decrease of 12 percent from the base year cost of $1.6 million. An increase in KV collections from $1.95/MBF to $4.65/MBF for fisheries improvement opportunities within timber sale areas would not be enough to offset a reduction in KV funding associated with a 90 percent reduction in ASQ. Net benefit in the first decade would be -$1.2 million, and would increase along with outputs to -$1.1 million by the fifth decade.

**Range:** Range output would average 6,609 animal months per year in the first decade after which the program would be discontinued. Program cost in the first decade would be $124,200 and net benefits would be -$90,400. There would be no costs or benefits associated with the program after the first decade.

**Forest Expenditures:** Refer to Table IV-22 for projected Forest expenditures for decades 1 through 5. Forest expenditures would range from $16.2 to $17.1 million in the first five decades. First decade expenditures would be $16.2 million, 13 percent lower than the base year level of $18.7 million. Timber program expenditures would decrease by $5.9 million to $3.7 million. Other Forest program expenditures would increase by $3.4 million, or 37 percent over base year expenditures of $9.1 million, with most programs receiving an increase in non-timber related funding.

**Employment and Income:** Refer to Table IV-23 for projected employment and income for decades 1 through 5. Employment would be 990 person-years during the first decade, a reduction of 1,267 jobs, or 56 percent below base year levels. Timber related employment would be reduced by 1,210 person-years, and Forest expenditure related employment by 77 person-years. This is offset to some degree by an increase of 51 person-years in recreation related employment. By the fifth decade, employment should grow to 1,155 person-years, or 51 percent of base year employment. The growth in employment would be in jobs generated by recreation and fisheries outputs. Expenditure related employment would increase slightly (10 person-years), range related employment would be eliminated, and timber related employment would not be recovered without an increase in Forest ASQ.

**County Revenues:** Refer to Table IV-24 for projected county revenues for decades 1 through 5. The 25 percent Fund would average $1.1 million in the first decade, a reduction of 81 percent from the base year level of $5.9 million; and would reach 32 percent of the base year level at $1.9 million in the fifth decade. Timber receipts would account for 99 percent of all Forest receipts. Timber yield tax returned to the counties would be $126,000 in the first decade, 14 percent of the base year level of $895,000. Yield taxes would continue to grow over time, reaching $211,300, or 24 percent of the base year levels, in the fifth decade.

**PNV:** Refer to Table IV-25 for total PNV and PNV components. The ECR alternative would rank fifth in total PNV at $0.4 billion. The opportunity cost associated with implementing this alternative would be $743.4 million. The “cash” PNV would be -$275.2 million, indicating that Forest receipts could not cover the cost of all Forest programs.

# RESOURCE MANAGEMENT PROGRAMS

## SPECIAL INTEREST AREAS

### Introduction

This section discusses the effects of alternatives in relation to the following issue.

Issue 15 How will Special Interest Areas be protected?

Chapter 3 and earlier portions of this chapter of the FEIS identified that the Horse Mountain,orth Fork Smith River, and Lassics Botanical Areas would be the only SIAs analyzed in detail in this section. The Lassics Botanical Area and the majority (61 percent) of the Horse Mountain Botanical Area are entirely within large reserves (LSRs [Late-Successional Reserves] for the PRF Alternative and category 1 HCAs [Habitat Conservation Areas] for the other alternatives). Since logging, including salvaging, and other silvicultural activities are prohibited in HCAs (Thomas et. al., 1990), and are only permitted to maintain or enhance late-successional or old-growth stand characteristics in LSRs during this planning period, timber management would not be an issue for the Lassics or the portion of the Horse Mountain area within HCAs or LSRs under any of the alternatives. The North Fork Smith River Botanical Area is entirely within the North Fork Management Area of the Smith River NRA, and is reserved from timber management in all alternatives.

Mountain bike use is currently limited or non-existent in the Lassics and North Fork Smith River Botanical Areas. Horse Mountain Botanical Area receives some low density use. Motorized recreation vehicles are currently permitted on all level 2 and better roads and designated routes. Level 2 and 3 roads are present in all botanical areas.

Botanical areas would be managed to protect unique botanical values and rare plants, as well as to provide the public an opportunity to recreate in these areas in keeping with resource protection. One objective of botanical area management is to conserve the full complement of species within the area. This includes rare plant species as well as species which comprise the array of plant communities within these areas.

Management direction for botanical areas encourages passive recreation in the form of nature study, bird watching, and other interpretation. Passive public recreation in these areas would continue to be encouraged, and the intended visitor experience would be to facilitate the discovery and exploration of an area's values.

### Consequences Common to All Alternatives

Consequences related to recreation would depend on the emphasis and scale of recreational development. Increased use could instill public support for long-term protection of these areas through partnerships and education, but the potential for intentional and inadvertent misuse would exist as well, with increased public demands for hiking, equestrian use, mountain biking, and motorized recreation vehicle use. The potential for adverse effects would be aggravated if marketing proceeds without concurrently upgrading area management (signing and trail designation or construction, for example) and law enforcement.

**Partnerships and education:** Increasing the profile of the botanical areas would promote public enjoyment of the areas which could ultimately help to foster support for their stewardship. Partnerships could greatly facilitate maintenance, enhancement, and protection of these areas. Partners could directly support management by contributing funds, indirectly by participating in cost-share projects. Increased public support would increase the need to prioritize recreation planning and management, such as signing and trails, to accommodate visitors. Marketing to local schools could increase the use of these areas as focal points for environmental education field trips and "living" laboratories. University classes and graduate students could use botanical areas to study native plant communities, rare plants, conservation biology, restoration techniques, and natural resources management. Increasing the environmental awareness of younger students and the understanding of natural systems at higher levels of study could cumulatively contribute to raising the consciousness of future generations with regards to respect for the natural environment.

**Hiking:** Until hiking/interpretive trails are developed, walkers would access the botanical areas on old roads and cross-country. Use of old road pavements would not constitute a significant resource problem; however, visitors may directly impact sensitive plants by

trampling individual plants, which occur on moderately gentle and open terrain (Thomas, 1992). The habitat for Lassics lupine, Lassics sandwort, and scabrid raillardella is moderately to highly unstable; walking upslope from sensitive plant occurrences on such unstable ground could indirectly affect plants by aggravating erosion and soil compaction, and eventually altering habitat and burying plants. Continued direct and indirect impacts to individuals could cumulatively contribute to the decline of a species, especially those which are endemic to the Lassics, or to loss of a local population.

**Equestrian use:** Pack animals could introduce non-native seed, which could directly impact the native flora by altering the genetic architecture of native plant populations. Specifically, cross-pollination between native and non-native species could "pollute" the genetic makeup of native plant populations (Ferreira and Hillyard, 1987). Other direct impacts related to pack animal use in botanical areas relate to trampling individual plants. Indirectly, introducing particularly invasive non-natives could change the species composition of plant communities by excluding natives and by habitat alteration; the latter would increase the likelihood of further non-native invasion. Other indirect effects include the displacement of native pollinators (Gordon, 1992; McClintock, 1987) and the potential to introduce foreign pests and diseases. Between polluting the gene pool of local populations and altering plant habitats through changes in plant composition and arrangement, introducing non-native seed could cumulatively bring about a degradation of entire plant communities, some of which support species which are already rare.

**Mountain biking:** Marketing mountain biking opportunities has the potential to increase resource degradation in botanical areas. The Lassics is particularly vulnerable to resource damage due to its geologically unstable setting, erodible soils, and open terrain. Continuous travel along a particular route (whether an existing road or cross-country) could create tracks which would concentrate water, directly aggravating erosional processes and contributing to cumulative loss of soil and plant habitat. Slope gradient could further exacerbate the problem as tires deeply scour the ground surface on an uphill climb. Tire tracks would directly impact plants located along the travel route.

**Motorized recreation vehicles:** Many of the resource conflicts mentioned in relation to mountain bikes pertain to motorized recreation vehicles, but the extent and nature of the latter would be greater. Motorized recreation vehicles traveling along designated routes would not cause the bulk of the impact. Illegal cross-country travel would cause more severe effects: direct impact to sensitive plants, destruction of existing vegetation, and aggravation of soil erosional processes. The shallow, low-productive soils of the botanical areas (composed of serpentine soils) are more susceptible to erosion resulting from motorized recreation vehicle use than more highly productive soils (Bridge, 1971). Due to their ability to travel across a wide range of terrain, all-terrain-vehicles (ATVs) could cause greater on- and off-site damage than four-wheel drive (4WD) vehicles. Degradation of plant habitat would indirectly and cumulatively affect the viability of sensitive plant species, with particular concern for the Lassics endemics.

Motorized recreation vehicle use in the Horse Mountain and North Fork Smith River Botanical Areas has the potential to introduce Port-Orford-cedar root disease into uninfected tributaries supporting Port-Orford-cedar (POC) stands.

Many rare and endemic plants in the North Fork Botanical Area occur in Port-Orford-cedar communities. Once the disease is introduced into a drainage, it spreads downstream and, even upstream if there is root contact (such would be the case with Bear and High Plateau Creeks), killing Port-orford cedar in its wake. Loss of POC would constitute a cumulative loss of the plant communities dominated by POC and those species allied to this community. Rare taxa which occur in POC communities include *Viola lanceolata* spp. *occidentalis* (Gray) Russell (western bog violet), *Castilleja elata* Piper (Siskiyou indian paintbrush), *Sanguisorba officinalis* L. (great burnet), *Darlingtonia californica* Torr. (California pitcher plant) and *Cypripedium californicum* Gray (California lady's slipper).

In addition to effects on the diversity of plant communities, POC contributes to the quality of riparian areas in the North Fork. POC is the primary overstory tree in the riparian zone. Loss of this key component would affect aquatic habitats and water quality through the removal of overstory shade and the root structure which holds the stream banks in place.

It was determined, from genetic research conducted across the range of POC in California, that the Horse Mountain population of POC contained genetic material distinctive from the other populations studied (Millar and Marshall, 1990).

Although non-vehicular sources could spread the disease, vehicles travel greater distances and potentially run a greater risk of contacting infected waters as compared to non-vehicular sources. Increased use of vehicles in the Horse Mountain and North Fork Smith River areas could indirectly introduce the disease into the creek. Cumulatively, introduction of the disease could bring about the loss of species diversity locally and the loss of genetic diversity to the species as a whole.

Motorized recreation vehicle use in botanical areas has the potential to reach a level where it can adversely affect the passive user's recreation experience. Unmanaged motorized recreation vehicle use would increase the potential for user conflict between hikers and vehicles.

Stumps, landings, or any other land disturbing activity would be in conflict with the visual quality objective (VQO) assigned to special interest areas, which states that these areas would be managed "to retain a natural appearance."

## Mitigations Common to All Alternatives

Standards and guidelines would protect sensitive plant species which occur in botanical areas. Biological evaluations would be conducted to determine if proposed actions might jeopardize the continued existence of sensitive species. Appropriate mitigations would be applied to reduce effects of any management activities. VQOs will be met.

## Consequences and Mitigations Specific to An Alternative

Program direction related to transportation (road construction and decommissioning) and recreation varies by alternative for both Lassics and Horse Mountain botanical areas; program direction related to timber varies only for the portion of the Horse Mountain Botanical Area outside HCAs or LSRs. The following discussion is presented by program area.

## Transportation Management-Horse Mountain and Lassics Botanical Areas:

**CUR, MKT, and ECR Alternatives:** Road construction has the potential to affect botanical area resources. Under these alternatives, level 2 and level 3 collector roads would be constructed in part to meet timber access and recreational objectives. These road levels are not maintained for passenger vehicles and thus would primarily be used recreationally by equestrian, mountain bike, and high clearance vehicle users. In the next decade, more miles of road would be constructed than decommissioned (2:1 ratio). Marketing of recreational opportunities would be implemented at a low level.

**Consequences:** Although road construction through botanical areas would not be consistent with the direction for their management, an increased road network near these areas would have the potential to increase off-site impacts and illegal cross-country travel into the areas. The direct, indirect, and cumulative impacts related to unmanaged pedestrian or vehicular use are described above under recreation. The low level of marketing for recreational opportunities would reduce the potential for resource damage and user conflicts.

**Mitigations:** Decommission or gate roads constructed for timber access near the botanical areas to deter use by recreationists. Locate level 3 collector roads for recreational purposes so as not to increase the potential for access into botanical areas.

**PRF and OGR Alternatives:** These alternatives propose to decommission more miles of road than would be constructed over the next decade. However, marketing of recreational opportunities would be expanded beyond the current level, including accommodations for equestrian, mountain bike, and motorized recreation vehicle users.

**Consequences:** Reduced road construction would reduce the potential for off-site impacts and illegal access into the botanical areas. Increased recreational marketing would increase the potential for resource impacts.

**Mitigations:** The same as for the CUR, MKT, and ECR alternatives.

## Transportation Management-North Fork Smith River Botanical Area:

Access into the botanical area is primarily along level 2 roads which are maintained for passage by high-clearance vehicles. The main route is the Wimer Road which runs along a western and northern ridgeline encircling the botanical area and then connects to the Patrick Creek Road adjacent to the eastern-most boundary of the area. Due to a history of mining in the area, there are numerous, unmaintained spur roads which connect to the main roads.

**CUR Alternative:** Transportation management in the CUR alternative has the potential to infect Port-Orford-cedar (POC) which occupies most of the drainages in the North Fork of the Smith, the potential for illegal cross-country travel over gently sloping woodland areas, and degradation of plant habitat and water quality due to erosion and sedimentation.

Certain roads in the area are not likely to pose much of a problem in terms of maintenance of POC ie. the Wimer Road which is located primarily along a ridgeline. However, continued access over roads which cross uninfected drainages increases the likelihood of introducing POC root disease into areas yet uncontaminated. Currently, access down 18N09 crosses Diamond Creek which is infected and then two uninfected creeks, namely Bear and High Plateau Creeks. Continued travel to 18N13 crosses the headwaters of yet another uninfected creek—Stony Creek. Runoff from 18N09 and spur roads in the High Plateau area could infect Peridotite Canyon and other unnamed tributaries draining the High Plateau area. If 18N09 and 18N13 are left open, there is a considerable risk that uninfected drainages, particularly Stony Creek, would become infected. The mitigating effects of seasonal closures are also questionable. Although falling more continuously during the winter and spring seasons, precipitation occurs in the North Fork area throughout the year; therefore, a rainy “season” is difficult to determine.

Jeffrey pine woodlands occur on relatively flat topographic areas which are very localized in the botanical area. High Plateau, located off 18N09, is a fine example of a Jeffrey pine woodland. These woodlands, more appropriately defined as Jeffrey pine/idaho fescue plant associations, are limited in their distribution and support rare taxa including *Lewisia oppositifolia* (Wats.) Rob. in Gray (opposite-leaved lewisia), *Castilleja brevilobata* Piper (short-lobed indian paintbrush), *Horkelia sericata* Wats. (Howell’s horkelia) and an undescribed *Silene* sp. nov. (campion). Also allied to these woodlands is a rare butterfly, *Polites mardon*, the Cascade skipper which is believed to use idaho fescue as a host plant (North 1995). Given the gentle topography of these woodlands and their proximity to certain roads, there is potential for illegal off-road/cross-country travel if all roads are open to vehicular access. Cross-country travel could directly impact rare plant species and degrade plant habitat, (with indirect effects to the Cascade skipper). Given the limited distribution of Jeffrey pine/idaho fescue woodlands, continued habitat degradation could lead to the cumulative loss of this plant community and its associated flora.

Soils derived from serpentine and peridotite are highly erodible (Kruckeberg 1984). Access along unmaintained spur roads contribute to the the degredation of plant habitat and water quality. Rilling and gully development contribute considerable sediment to the North Fork Smith.

**MKT Alternative:** As compared to the CUR alternative, this alternative would moderately reduce the potential of adverse effects to the POC plant community by controlling vehicular access along 18N09 which runs along Diamond Creek and ends at High Plateau, and 18N13 which crosses the headwaters of Stony Creek, as well as restricting access during periods of heavy rain in the summer. Controlled access via permitting allows for environmental review and education with regards to protection of rare plant resources and POC.

**ECR Alternative:** This alternative further reduces the potential adverse effects to the POC plant community by prohibiting access along a critical section of 18N13, closing spur roads located off of 18N13 and allowing for permitted access only during dry periods.

Stony Creek is the largest uninfected drainage in the North Fork Smith Botanical Area. 18N13 crosses a headwater tributary to Stony Creek and is the only road in the Stony Creek drainage. Access from 18N09 to 18N13 requires that one cross Diamond Creek which is infected. Prohibiting access along the section of 18N13 which crosses Stony Creek (from the

lookout site to road 314) significantly reduces the potential for disease introduction.

Closing spur roads off of 18N13 would help reduce the potential to infect Peridotite Canyon and other unnamed tributaries; however, the disease could still be introduced due to road-related runoff from access along the upper portion of 18N13.

Permitted access is allowed along 18N09 into the High Plateau area. Access to High Plateau requires crossing Diamond Creek which is infected and then crossing two uninfected creeks. In addition, runoff from roads in High Plateau and the potential for cross-country travel has a medium to low risk of introducing the disease into tributaries of Peridotite Canyon and other unnamed tributaries. Permitted access allows for environmental review and an opportunity to educate the permittee.

**PRF Alternative:** The consequences of implementing this alternative are similar to those mentioned above except this alternative affords more protection to the POC community by prohibiting access along the entire length of 18N13. This added measure would protect introduction of the disease from road-related runoff into Peridotite Canyon and other unnamed tributaries.

Tributaries draining High Plateau have a low risk of becoming infested with the disease due to road-related runoff and the potential for cross-country travel. Bear and High Plateau Creeks also have a low risk of becoming infected with the disease under this alternative. Permitted access allows for environmental review and an opportunity to educate the permitee.

**OGR Alternative:** This alternative has the greatest potential of maintaining botanical area values by protecting the core of the botanical area and its associated uninfected tributaries through the prohibition of vehicles beyond the Diamond Creek crossing to route 314. One exception is the access required for those with an approved annual mining plan of operations and for those administering approved mining operations.

## Recreation Program Management:

**CUR, MKT, and ECR Alternatives:** The recreation resource program would be less under these alternatives than in the PRF and OGR alternatives. Marketing of opportunities would occur at a lower level, equestrian and mountain bike opportunities would not be developed, and motorized recreation vehicle use would be at a lower level.

**Consequences:** Without a certain level of marketing, opportunities for developing partnerships, garnering greater public support, and implementing management plans would be reduced. Resource impacts would not significantly increase under these alternatives, with the exception of increased road construction expected under the CUR and MKT alternatives (see Transportation and Facilities Management section of this chapter).

**Mitigations:** Ensure public support and education through articles in local papers, brochures, and working with local communities. Better manage visitor use through signing, educational means, fencing, and road closures. Designate which roads are opened (or closed) to motorized recreation vehicles and ensure law enforcement.

**PRF and OGR Alternatives:** Marketing recreation opportunities under these alternatives would include regional markets; trail management would include equestrian and mountain bikes; and new facilities to accommodate motorized recreation vehicle use would be constructed.

**Consequences:** Recreation management Forest-wide would increase under these alternatives from the present. Recreation use of botanical areas would be greater, and the resource impacts discussed under common consequences would be expected to increase much more than under the CUR, MKT, and ECR alternatives. Growing demand to maintain the values of the areas would necessitate installing informational signs, constructing trails, and rehabilitating or decommissioning problem roads to deter resource damage. Increased motorized recreation vehicle use would increase the potential for user conflict between hikers and vehicles. Opportunities for developing partnerships, garnering greater public support, and

implementing management schedules would be greater than in the CUR, MKT, and ECR alternatives.

**Mitigations:** Mitigations for increased visitor use for all the above recreational areas focus upon marketing emphasis, planning, education, and law enforcement. Market emphasis for botanical areas could be reduced or focused on passive forms of recreation. Areas developed for potentially more impacting forms of recreation could be planned outside of the botanical areas and environs (the latter intended to reduce off-site impacts or potential access into the botanical area). Trail construction and educational signing could be used to guide use in the areas. Some problem roads could be rehabilitated, gated or obliterated. Signs, brochures, and other written/visual media could be used to educate visitors and subsequently to discourage resource damage. The presence of law enforcement officials could deter illegal and inappropriate use of botanical areas.

## Timber Management:

Consequences related to timber management only pertain to the Horse Mountain Botanical Area.

**CUR, PRF, and OGR Alternatives:** The Horse Mountain Botanical Area would be managed to maintain its unique botanical values. No timber management activities would be permitted.

**Consequences:** There would be no consequences related to timber management for these alternatives.

**Mitigations:** No mitigations would be needed.

**MKT Alternative:** Four hundred twenty (39 percent) of the 1,077 acres in the Horse Mountain Botanical Area would be available for timber harvest; these lands are comprised of several vegetative associations. Two species, Jeffrey pine and huckleberry oak, are indicative of serpentine sites which are very low in site productivity: it takes 300 years for the site to grow trees 75-125 feet tall (Jimerson, 1992).

**Sensitive Plants:** Sensitive and other rare plants are commonly associated with serpentine. Pale yellow stonecrop (*Sedum laxum ssp. flavidum*) is the only Forest sensitive species documented in the area. The species generally occupies exposed and partially exposed outcrops along ridges. Other rare plants in like habitat of the Horse Mountain area include evergreen everlasting (*Antennaria suffrutescens*) and Heckner's stonecrop (*Sedum laxum spp. heckneri*).

**Consequences:** Logging-related activities, including road construction, log skidding, and use of outcrops as rock sources could directly impact the stonecrop. The majority of the occupied and potential habitat for sensitive and rare species would be outside the area available for logging; because serpentine sites are highly marginal timber land (thereby raising the question of their suitability for timber management), there are no identified cumulative impacts to the species as a whole.

Potential habitat for sensitive plants is lacking in the forest below the serpentine parent material break; therefore, consequences to the sensitive plant resource would not exist.

**Mitigations:** Locate logging roads so as not to dissect rock outcrops. Locate non-serpentine rock sources off-site. Avoid rock outcrops in skidding logs or in road location.

**Fragmentation of the Area:** The Horse Mountain Botanical Area would be established primarily for its support of serpentine flora. Most of the area that would be available for logging is not serpentine soil and is in a different watershed than the serpentine areas.

**Consequences:** Logging occurring on the non-serpentine soils would not directly or indirectly affect the integrity of the botanical area. Over time, with subsequent management of the plantations, impacts related to non-native species invasion could cumulatively impact the integrity of the native plant communities and species within the botanical area. Effects related to non-native species introduction are covered in the section dealing with equestrian use under consequences in common.

**Mitigations:** Take precautions for reducing the potential for non-native introductions (use "weed free" or rice straw mulch in erosion control practices, for example). Reforest area with stock grown from locally collected seed. Apply silvicultural prescriptions which

serve to reduce the edge effect between land managed for timber and land managed for other resource values.

**ECR Alternative:** Emphasis would be on maintaining the biodiversity of indigenous vegetation types; however, the portion of the area outside of the HCA would be included within the general forest land base. The intent of this alternative would be to maintain or create landscapes "reflective of natural diversity" and to maintain indigenous vegetation types (serpentine vegetation being limited across the landscape).

**Consequences:** The consequences of logging in this area would be the same as for the MKT alternative. However, since logging in a botanical area would be inconsistent with the intent of this alternative, the consequences of implementing this alternative would be expected to be less than implementing the MKT alternative.

**Mitigations:** The same as for the MKT alternative.

## HERITAGE RESOURCE MANAGEMENT

### Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 17 What constitutes reasonable protection of Indian cultural activities and values?

The amount and intensity of various land management activities relates to the probability of impacting cultural resource sites and current Indian activities and values (cultural resources). The greater the amount and intensity of activities, the higher the probability of impacting unknown or undiscovered cultural resources.

### Consequences Common to All Alternatives

Effects to cultural resources range from disturbance, destruction, or loss of part or all of the resource, to modification of the environmental setting around a site such that its basic sense of feeling or place is altered or destroyed. The greater the number of known or potential cultural sites or use areas that fall within the areas where land management activities are permitted, the greater the risk of adversely affecting cultural resources.

**Direct Effects**: Ground disturbing activities have the potential to directly impact cultural resource properties and values.

**Indirect and Cumulative Effects**: Indirect effects of project activities could have long range cumulative effects on cultural resources. Improved access through road construction/reconstruction and trail construction would make sites and areas easier to reach and create a higher probability of artifact theft and site destruction. Increased public knowledge of and access to areas of sacred values for the Indian community could have a long range effect on an Indian user's traditional spiritual activities.

### Mitigations Common to All Alternatives

Mitigations would be similar with implementation of any alternative. Standards and guidelines would provide a means to minimize or mitigate direct adverse effects on cultural resources incurred by Forest management activities, vandalism, or natural deterioration. However, situations may arise where

site damage occurs without knowledge or discovery by the Agency.

Cultural resource inventories are conducted for any undertaking on the Forest where cultural resources could be affected directly or indirectly. These areas are intensively surveyed for cultural sites; when necessary, interviews are conducted with individuals who might have knowledge concerning historic or contemporary values within the project area.

In cases where cultural resources might be affected by an undertaking, the Forest follows procedures outlined in 36 CFR 800 (implementing regulations for the National Historic Preservation Act) for consulting with the State Historic Preservation Officer and Advisory Council on Historic Preservation.

Historically, the standard practice on the Forest to protect cultural resource sites has been to “flag-and-avoid”. Approximately 90 percent of the sites inventoried on the Forest have been treated in this manner. Where proposed undertakings threatened to impact the other 10 percent of inventoried sites, either the sites were determined to not qualify for the National Register of Historic Places or data recovery (archaeological excavation) was done before the undertaking proceeding. In many undertakings, different equipment or design features were incorporated in project planning and execution to mitigate effects upon cultural resources.

Indirect effects upon cultural resources are mitigated primarily by not drawing attention or increasing access to sensitive areas.

No mitigation measures specific to an alternative were identified. Specific mitigations will be addressed at the project level.

## Consequences Specific to An Alternative

### PRF, OGR, and ECR Alternatives

### Direct and Indirect Effects:

These alternatives could have the least effects upon cultural resources from potentially impacting activities on 8,066 to 11,101 acres over the next decade. These activities include harvesting 116,000 MBF (ECR), 155,000 MBF (PRF), and 265,000 MBF (OGR) over the next decade. However, these alternatives would allow for less acres to be inventoried annually for cultural resources. Therefore, fewer cultural resources could be identified and managed for their unique values than in other alternatives.

### CUR and MKT Alternatives

### Direct and Indirect Effects:

These alternatives could have the greatest effect on cultural resources from potentially impacting activities on 23,656 to 25,560 acres over the next decade. These activities include harvesting 670,000 MBF (CUR) to 949,990 MBF (MKT) over the next decade. These alternatives could also provide for the identification of a greater number of cultural resources.

# TRANSPORTATION AND FACILITIES MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 18 Has the Forest considered stopping new road construction and/or obliterating existing roads?

Roads, in particular new construction and reconstruction, have major interactions with nearly all environmental components. A multitude of direct, indirect, and cumulative effects on various resources are associated with roads; these effects are included in the discussions for those environmental components in this chapter. Major interactions and their associated environmental effects in this discussion are limited to those that affect the transportation system and its management.

Facilities such as administrative sites, utilities, roads and bridges, water impoundment and storage facilities, and other improvements are an important part of the human environment; they are described in the Transportation and Facilities section of Chapter 3. Recreation facilities, including developed recreation sites and trails, are discussed in the Recreation section of Chapter 3.

## Assumptions Common to All Alternatives:

1. Increasing use of the Forest and changing use of private lands within and adjacent to the Forest will increase conflicting demands for access to new facilities, improved access to existing facilities and private lands, and closing or gating roads to protect resources and private land values.

2. Forest-wide standards and guidelines, as they apply to location, design, operation, and maintenance of roads, assure that roads will accommodate their intended use over time.

3. Project-specific consequences on the forest transportation system cannot be addressed in this document but will be addressed through project-level NEPA review as new projects requiring road access are proposed and as existing roads are proposed for change in maintenance level, temporary or permanent closure, or obliteration to meet a variety of management needs.

4. All alternatives require constructing some new roads for timber access. The majority of new construction will be in support of the timber sale program.

5. Roads are designed for a 20 year life. Therefore, all roads will be reconstructed every 20 years; or, approximately one half of the road miles in the transportation system will be reconstructed every decade.

6. Forest Development Roads — those forest roads under the jurisdiction of the Forest Service — are constructed to certain standards depending on the needs identified for access. Roads will be maintained and available for use at maintenance levels commensurate with the identified needs. Maintenance levels are described below.

**Level 1 maintenance** provides the basic care needed to protect road investment and minimize damage to adjacent land and resources. Drainage facilities will be maintained and runoff patterns controlled to keep the road stable. These roads are normally not open for traffic. Roads that are used solely for timber resource access will, after periods of timber haul, be treated to discourage vehicular access and maintained at this level.

**Level 2 maintenance** provides the basic care described above and keeps the roadway clear for safe passage, route markers and signs in place and usable. These roads are open for high clearance vehicle use and are not usually considered suitable for passenger cars. Use will be approximately 35 percent for timber resource functions and 65 percent for general purpose and recreation use.

**Level 3 maintenance** provides the basic care and safe and moderately convenient travel suitable for passenger cars. These roads are open for public traffic, and are normally surfaced with aggregate material. This is the minimum level of maintenance for timber resource access roads during periods of timber haul; otherwise roads maintained at this level are used primarily for general purpose and recreation access.

**Level 4 maintenance** provides for greater user comfort than level 3 maintenance. These roads are open for public traffic and are normally surfaced with aggregate material, or may be paved. Roads maintained at this level are used primarily for general purpose and recreation access.

**Level 5 maintenance** provides for greater user comfort than level 4 maintenance. These roads are open for public traffic and are surfaced with aggregate material or paved. Roads maintained at this level are used primarily for general purpose and recreation access.

Some roads are closed to meet resource management objectives. Closures are used to discourage or eliminate use by motorized vehicles over 50 inches wide. A few road closures may altogether eliminate traffic where resource sensitivity is of particular concern. The purposes for closures include protecting water quality, erosion control, public safety, reducing road user conflicts, reducing maintenance costs, legal mandates, managing recreation opportunity, and protecting wildlife and wildlife habitat. Closures may be permanent or periodic. Road closures are authorized in the Code of Federal Regulations, Title 36, Part 261.

## Consequences Common to All Alternatives

### Direct Effects:

Some existing roads would be decommissioned under all alternatives. Some roads constructed for timber harvest access during the planning period and 50-year horizon would also be decommissioned under all alternatives. The greatest percentage of change would occur in the first 2 decades for all alternatives, after which 99 percent of the miles of road planned for level 3 or higher maintenance would be in place. Two miles of road would be decommissioned and 2 to 2.5 miles constructed during each of the last 3 decades of the planning horizon under all alternatives.

Public use of Forest resources and Forest Service use and protection activities have major direct and indirect effects on Forest roads. Land allocations which attract people can cause traffic on existing roads. Vehicles, weather, people, and vegetation encroaching into the traveled way cause wear on roads. Private land uses may change from timber management to seasonal recreation or year around residential use, increasing the traffic intensity and lengthening the season of use on state, county, and forest roads providing access to private land. Some roads would not be maintained to provide the level of comfort or convenience some users would like.

### Indirect Effects:

The indirect effects for all alternatives are primarily those related to road maintenance and closure. These effects, which are essentially the same for all alternatives, vary by the amount of construction, reconstruction, and total system at a specific point in time. They will be addressed further in project-level NEPA review. Various levels of maintenance will be performed on existing and added miles of road during the planning period.

Reduction in timber receipts associated with reduced timber harvest from previous harvest levels would result in reduction of the 25 percent fund shared with counties for roads and schools. The county roads that are an integral part of the transportation system for much of the rural community could suffer from declining maintenance. Some of the loss in road monies would be offset by less logging traffic and the associated wear on roads resulting from lower timber harvest rates.

### Cumulative Effects:

No significant adverse cumulative effects were found to impact the Forest transportation system and its components for any alternatives, although it is recognized that declining budgets have the potential to result in a long term decline in county road systems.

## Mitigations Common to All Alternatives

Maintain Forest roads on a scheduled basis, according to the Forest Road Maintenance Schedule and the Forest-wide standards and guidelines, to protect the initial investments and resources.

As demand and use change with time, capital investment funds could be used to mitigate adverse effects on the road system. An example might be paving a road to accommodate increased winter traffic. In cases where capital investments are not justified, roads might be closed to prevent resource damage.

Decommission or close roads or maintain at a lower level to reduce costs on some roads and increase available funds for others.

Reconstruct roads earlier than scheduled to provide a suitable facility when excessive traffic wear resulting from deferred maintenance or storm damage has occurred.

Place the responsibility on the private land owner for reconstruction and additional maintenance of Forest roads associated with private land development. Require that a landowner's association assume responsibility for maintaining all subdivision access roads that are not needed on the Forest transportation system and not part of a county road system.

No additional mitigations were identified for specific alternatives.

## Consequences Specific to An Alternative

The Forest Development road system currently contains about 2,490 miles. The projected effects of the various alternatives on the transportation system are shown below. Table IV-26 shows the projected direct effects of each alternative on the number of road miles in the Forest Transportation System in miles at end of each decade, miles constructed and decommissioned during each decade, net change during each decade (numbers are rounded to nearest 5 miles), and 5-decade change.

**Table IV-26. Miles in Forest Transportation System**

| | Alternative | | | | |
|---|---|---|---|---|---|
| | CUR | PRF | OGR | MKT | ECR |
| Decade 1 | 2,590 | 2,265 | 2,395 | 2,600 | 2,580 |
| Construction | 200 | 25 | 25 | 210 | 210 |
| Decommissioning | 100 | 250 | 120 | 100 | 120 |
| Net change | +100 | -225 | -95 | +110 | +90 |
| Decade 2 | 2,580 | 2,060 | 2,290 | 2,595 | 2,545 |
| Construction | 90 | 25 | 15 | 95 | 95 |
| Decommissioning | 100 | 230 | 120 | 100 | 130 |
| Net change | -10 | -205 | -105 | -5 | -35 |
| Decade 3 | 2,585 | 2,060 | 2,295 | 2,600 | 2,550 |
| Construction | 25 | 20 | 25 | 25 | 25 |
| Decommissioning | 20 | 20 | 20 | 20 | 20 |
| Net change | +5 | 0 | +5 | +5 | +5 |
| Decade 4 | 2,590 | 2,060 | 2,300 | 2,605 | 2,555 |
| Construction | 25 | 20 | 25 | 25 | 25 |
| Decommissioning | 20 | 20 | 20 | 20 | 20 |
| Net change | +5 | 0 | +5 | +5 | +5 |
| Decade 5 | 2,595 | 2,060 | 2,305 | 2,610 | 2,560 |
| Construction | 25 | 20 | 25 | 25 | 25 |
| Decommissioning | 20 | 20 | 20 | 20 | 20 |
| Net change | +5 | 0 | +5 | +5 | +5 |
| 5-decade change | | | | | |
| Total construction | 365 | 110 | 115 | 380 | 380 |
| Total Decommissioned | 260 | 540 | 300 | 260 | 310 |
| Net change from present by 2040 | +105 | -430 | -185 | +120 | +70 |

## CUR Alternative

### Direct, Indirect, and Cumulative Effects:

This alternative would result in a 4.1 percent increase in miles of road during the first decade. This is about the same as the total net change projected through the fifth decade. Road miles for the first 2 decades would include 82 percent of new construction and 77 percent of decommissioning projected for 5 decades. Fifty-nine percent of roads constructed through the fifth decade would be maintained at level 1; 34 percent at level 2; 7 percent at higher levels.

## PRF Alternative

### Direct, Indirect, and Cumulative Effects:

This alternative provides for the greatest net decrease in miles of road in the first 2 decades and no change in miles in the third through the fifth decade. It would result in a 9 percent decrease in miles of road during the first decade, approximately 52 percent of the total net change projected through the fifth decade. Road miles for the first 2 decades would include 45 percent of new construction and 89 percent of decommissioning projected through the fifth decade. Forty-nine percent of roads constructed through the fifth decade would be maintained at level 1; 34 percent at level 2; 17 percent at higher levels.

## OGR Alternative

### Direct, Indirect, and Cumulative Effects:

This alternative would have the second largest decrease in road miles in the first decade, resulting in a 3.9 percent reduction, or approximately 51 percent of the total net change projected through the fifth decade. Road miles for the first 2 decades would include 32 percent of new construction and 80 percent of Decommissioning projected through the fifth decade. Fifty percent of roads constructed through the fifth decade would be maintained at level 1; 28 percent at level 2; 22 percent at higher levels.

## MKT Alternative

### Direct, Indirect, and Cumulative Effects:

This alternative would have the greatest increase in road miles in the first decade (4.5 percent) and through the fifth decade (4.9 percent). Road miles for the first 2 decades would include 80 percent of new construction and 77 percent of decommissioning projected through the fifth decade. Percentages at each maintenance level would be the same as in the CUR alternative.

## ECR Alternative

### Direct, Indirect, and Cumulative Effects:

This alternative would result in a 3.7 percent increase in road miles in the first decade, 30 percent more than the projected total increase by the end of the fifth decade. Road miles for the first 2 decades would include 59 percent of new construction and 81 percent of decommissioning projected through the fifth decade. Percentages at each maintenance level would be the same as in the CUR alternative.

# FIRE AND FUELS MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 20 How should the Forest manage fire to protect and improve resources?

Variations in wildfire occurrence, intensity, and extent are influenced by various land allocations and uses and management activities, such as amount and type of harvesting, fuel treatment, and suppression effectiveness, associated with each alternative. Other factors, such as natural fuels build-up, accessibility, and weather variations, will also influence the level of inherent hazard that exists within the Forest. Since wildfires do not respect administrative boundaries, management direction and activities on adjacent land and inholdings may also affect the number, size, and intensity of wildfires that occur on the Forest.

Aggressive suppression and prevention efforts over the last 80 years have resulted in higher natural fuel loadings in unburned stands than would have occurred under a natural fire frequency sequence. This, in combination with increased visitor use and high quantities of fuel left on the ground following thinnings or conventional harvesting, could lead to large and intense wildfire events. Fuel management programs are designed to strategically reduce these fuel loadings to acceptable levels, thereby reducing wildfire hazard. Fuel treatments are also used for site preparation for revegetation following harvesting and to improve the quantity and quality of wildlife habitat, rangelands, and basketweaving materials.

## Consequences Common to All Alternatives

## Wildfire:

All alternatives would require an appropriate fire suppression response to all wildfires including those occurring on private lands under direct Forest Service protection. Interagency fire cooperation utilizing a “closest force” concept would be emphasized under all alternatives. Suppression response within certain areas, such as wilderness, may change from control to containment or confinement when associated Fire Management Action Plans have been approved.

Due to the wide range of variability associated with wildfires, it is economically infeasible to develop an organization that would control all fires all of the time. Therefore, the wildfire detection, prevention, and initial response organization is designed so that individual fire starts can generally be controlled on a typical hot, dry, windy day in mid to late August. Sometimes circumstances occur that make wildfire suppression extremely difficult, including severe weather patterns, multiple fire starts, or when wildfire events in other parts of the state or country deplete existing suppression resources. Under these situations some wildfires may grow to be large, with devastating resource results.

**Direct Effects:** The effect of wildfires on individual resources would vary, with negative effects generally increasing as fire intensities increase. Regardless of intensities, wildfires (especially those that exceed initial attack) could cause negative consequences to young plantations and resource quality related to water, air, soil, botanical, and visual resources. Once revegetation has occurred, these negative impacts would be lessened.

Low to moderate intensity wildfires could result in the following resource benefits: (1) reduced potential for damaging wildfires, (2) improved wildlife habitat, (3) increased water yields, (4) improved rangeland, (5) increased opportunities for special product and cultural use harvesting, and (6) increased production of certain botanical species.

**Indirect Effects:** The placement of firelines and fire camps and the implementation of fuel treatment activities could be affected by the presence of cultural sites, threatened, endangered, and sensitive plant and animal species habitats, and other features which must be protected under mandatory legal requirements.

Wildlife and soils objectives require large woody debris to be left on the ground following management activities. Depending on the amount of fuel left, this could result in increased suppression difficulties and subsequent larger, more intense wildfires. These wildfires could, in turn, degrade soil structure, wildlife habitat, and air and water quality.

If wildfires kill standing trees and the trees are not salvaged, snags and subsequent down woody material would be created. This could benefit wildlife habitat. At the same time these snags and down woody material could present dangerous situations for firefighter safety and increase fire spread through

spotting and material rolling down to the bottom of a canyon.

Increased recreation use, especially as a result of the creation of the Smith River National Recreation Area, is expected to increase the amount of human-caused wildfire ignitions. As some roads become obsolete and are decommissioned or vehicular access is denied or discouraged by gates or barricades, the potential for human ignitions would lessen. At the same time, closed roads could increase response time for suppression forces or require aerial resources to respond to the incident. This decrease in access could increase the potential for larger final fire sizes and higher suppression costs.

**Cumulative Effects:** Fire suppression under a control strategy attempts to keep fire sizes to a minimum acreage, thus continuing to allow natural fuels to build up in protected areas. This increases the potential for large, devastating wildfires if an ignition occurs under severe burning conditions (for example, high winds or low relative humidities). Increased risk to life and property could occur, along with health impacts from prolonged, extensive smoke exposure. (Refer to the Air Quality section in this chapter for further discussion of smoke effects from wildfires.)

## Fuels Management:

The most effective fuel treatment method is used to achieve objectives related to hazard reduction and resource requirements. Alternative treatment methods, such as biomass utilization, chipping, or fuelbreaks, are used in some areas to achieve environmentally and ecologically sensitive objectives. But prescribed fire remains the most common method of fuel treatment, especially in areas of steep topography and limited access.

**Direct Effects:** Environmental effects of prescribed fire are evaluated on a site-specific basis as burn plans and prescriptions are developed. Variations in ignitions by time-of-year can reduce the negative impacts of prescribed burning. For example, burning under wetter, spring-like conditions results in reduced intensities leaving more woody debris on the ground for wildlife habitat and increased soil productivity. At the same time, restrictions in spring burning in the vicinity of critical habitats due to smoke concerns during the nesting season may result in the use of a fall season burn. Fall burns may be more intense due to summer drying of the fuels, resulting in prolonged smoke and increased potential for escape and degradation of wildlife habitat and soil resources.

The environmental consequences resulting from prescribed fire differ among broadcast burning, understory burning, and the burning of piled woody material. Broadcast and understory burning have more limited seasonal time frames for execution due to weather and fuel characteristics. As a result, some resource objectives may be delayed or may not be achievable. Smoke would be concentrated in a shorter period of time than it would be if piles were burned. Escape potential of broadcast burns is higher than for pile burning because of the dispersed nature of the fuel over the entire unit and the typically steeper slopes. Understory burning also has the potential to damage standing trees on the site by scorching the canopy or damaging the bole of the tree.

Natural fuels treatment could be used in areas outside of managed units to benefit the following concerns: (1) public and firefighter safety, (2) major capital investments (for example, structures and plantations), (3) frequent or increasing fire occurrence areas, (4) coordinated resource benefits, including cultural, wildlife, and range resources, and (5) forest health and biodiversity. Alternative treatment methods other than prescribed burning would also be used for natural fuels treatment where feasible and economically efficient.

**Indirect Effects:** Snags are often left within or adjacent to the treatment units to provide nesting habitat. These snags and woody debris left for wildlife could pose a major threat to the safety of prescribed burning or suppression personnel. These materials also could add to the rate of spread and intensity of wildfires if they rolled down to the bottom of a unit or if flaming embers spotted ahead of the fire.

**Cumulative Effects:** Over time, large area fuel treatments could improve the overall health and productivity of the Forest by opening up stands and returning fuel loadings to more natural levels. The wildfires that will eventually occur in these treated areas could be less damaging.

By not treating forest fuels aggressively (because of either insufficient funding or environmental restrictions) fuel loadings would continue to accumulate beyond natural levels, creating the possibility for large, extensive wildfires.

## Mitigations Common to All Alternatives

Prescribed burning is a commonly used technique for fuel management of both project and naturally generated fuels. Lower intensity fires that are undertaken under controlled and monitored conditions can reduce the fine fuels that carry wildfires, improve rangelands and wildlife habitats, increase water yields, improve quality and quantity of basket weaving materials, and open sites up for successful planting and seedling survival. Prescribed fire can present a risk of becoming an escaped fire due to unforeseen changes in local weather or from holdover embers, but this risk is usually minimal.

Due to various environmental concerns (air quality, biodiversity, wildlife habitat enhancement) other fuel treatment efforts such as increased utilization, chipping, pile burning, establishing fuelbreaks, crushing, or supplemental protection may get more emphasis in the future. At the same time these alternative methods may not be as successful for hazard reduction because they do not reduce the fine fuels that carry a wildfire. Also, these other methods may not be feasible in some areas due to factors of topography or access, or economic considerations.

Mitigations to reduce the chance for tree damage during understory burning could include clearing fuels away from the base of trees, pruning low branches, or pretreatment of trees with ground based fire retardants or water. These methods dramatically increase treatment costs, especially on steeper ground. Also, protection of all trees is not possible, especially in multiple layered stands or in those areas with a high tree density. Standing trees that are killed contribute to the snag component and eventually to the down woody debris component.

Pile burning results in some protection of sensitive soil productivity and water quality by concentrating the fuels and soil heating damage in a relatively small area. Pile burning is often used along roads, with machine piling used on slopes less than 30 percent and hand piling used on slopes less than 70 percent. Due to the extreme topography on most of the Forest, pile burning is of limited use except along roads or to mitigate smoke concerns.

Additional mitigations identified for the PRF alternative are discussed below.

## Consequences and Mitigations Specific to An Alternative

Table IV-27 compares the number of acres projected for fuel treatment related to timber activity per year per decade by alternative. The 3-year average treated from 1988 through 1990 was 3610 acres.

**Table IV-27. Timber-Related Fuel Treatment**

| Alternative | Annual Acreage by Decade | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| CUR | 2,430 | 1,780 | 2,300 | 1,590 | 2,040 |
| PRF | 390 | 360 | 350 | 340 | 350 |
| OGR | 770 | 750 | 700 | 440 | 540 |
| MKT | 2,250 | 3,750 | 1,720 | 1,770 | 1,910 |
| ECR | 1,050 | 1,000 | 940 | 950 | 940 |

Hazard-related fuel treatment is for hazard reduction of natural fuels. Table IV-29 compares the number of yearly acres projected for hazard-related fuel treatment by decade by alternative.

**Table IV-28. Hazard-Related Fuel Treatment**

| Alternative | Annual Acreage by Decade | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| CUR | 800 | 800 | 400 | 400 | 400 |
| PRF | 4,000 | 4,000 | 4,000 | 4,000 | 4,000 |
| OGR | 1,600 | 1,600 | 1,200 | 1,200 | 1,200 |
| MKT | 800 | 800 | 400 | 400 | 400 |
| ECR | 1,200 | 1,200 | 900 | 900 | 900 |

Table IV-29 includes fuel treatments for other resources, including rangeland and wildlife habitat improvement, cultural burning, and botanical resource enhancement.

**Table IV-29. Fuel Treatment for Other Resources**

| Alternative | Annual Acreage by Decade | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| CUR | 200 | 200 | 200 | 200 | 200 |
| PRF | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| OGR | 900 | 900 | 900 | 900 | 900 |
| MKT | 400 | 400 | 400 | 400 | 400 |
| ECR | 900 | 900 | 900 | 800 | 800 |

## CUR Alternative

### Direct and Indirect Effects:

Clearcutting would only be used where no practical alternative exists. This indicates that broadcast burning of clearcut areas would be at a minimum, but understory burning and hand/mechanical piling and burning, associated with alternative strategies, could be viable fuel treatment options. Minimum size clearcuts of five acres could increase the cost and potential for damage to adjacent units when prescribed burning is used as a treatment alternative. This alternative emphasizes full product utilization, which might reduce the need for or the intensity of fuel treatments in some units.

The 74 percent of the Forest excluded from land disturbance and timber management activities would have an emphasis of natural fuel treatment, especially for improving rangelands, providing for basket weaving materials for Native Americans, and protecting capital investments. This is especially critical because of the closing or decommissioning of all level one roads in this alternative. This could increase arrival times and create a shift to aerial attack.

## PRF Alternative

### Direct and Indirect Effects:

The emphasis on a multi-storied forest structure creates the potential for an increase in ladder fuels, especially during the early years of understory growth when the fuels are continuous vertically. Given an ignition, this structure could produce crown fires which are larger, more intense, and more damaging to resources than ground fires. Hardwood management could result in less fuels on the ground, but it may contribute to the ladder fuel component. Minimum size individual regeneration openings of five acres could increase the potential for damage to adjacent units when prescribed burning is used as a treatment alternative.

Thinning operations without adequate removal of material would increase fuel loadings, creating greater potential for more intense wildfires or escapes in adjacent prescribed burn areas. Multiple entries could also increase the number of fuel treatments required for a specific area, unless high levels of utilization standards were implemented.

Because of the large percentage of the Forest that would be removed from timber management activities, this alternative would have one of the greatest opportunities for natural fuel treatment to reduce fuel loadings to presuppression, more natural levels.

This alternative proposes minimum standards for new roads and the greatest amount of road decommissioning. This could result in increased arrival times and larger wildfires because of removing access, leaving roadside fuel hazards, or having to clear roads for access by equipment. At the same time, reduced road access could result in fewer human-caused ignitions.

Creating new recreation facilities and trails, upgrading existing facilities, and regional marketing of recreation opportunities would increase visitor use, increasing the potential for more wildfire ignitions.

### Mitigations:

This alternative proposes the largest number of hazard-related fuel treatment acres. The goal of hazard-related fuel treatments would be to return fuel loadings to presuppression levels. Natural fuel treatments would be conducted to mitigate ladder fuel situations and the reduction in open road densities. Utilization standards would be emphasized where possible to reduce negative resource effects of prescribed burning. Because of the increased escape potential in smaller burn units of five acres, alternative fuel treatments or the inclusion of a larger surrounding area would be investigated for their economic and hazard reduction benefits. A fire prevention emphasis would occur to mitigate the potential for increased

visitor use. Wildfire risk awareness in local schools and communities would be emphasized.

Gates and barriers may be a viable alternative to road obliteration in some key access areas. Increased air attack may be necessary for this alternative as a mitigation for reduced road access.

Natural fuel treatment would be emphasized for a number of other resources, including improving rangelands, providing for basket weaving materials for Native Americans, and protecting capital investments.

## OGR Alternative

## Direct and Indirect Effects:

An emphasis on preserving late successional forests would result in leaving large woody material and snags for wildlife habitat concerns. This could result in higher suppression difficulty and costs and potential injury to firefighters and prescribed burning personnel. Because of the large percentage of the Forest that would be removed from timber management activities, this alternative would have one of the greatest opportunities for natural fuel treatment to reduce fuel loadings to presuppression, more natural levels.

Increased emphasis on recreational opportunities and minimum road standards and reduced road access would have the same consequences as in the PRF alternative.

## MKT Alternative

## Direct and Indirect Effects:

Since this alternative has the highest amount of harvesting, timber-related fuels treatment would be emphasized. Silvicultural treatments would predominantly be broadcast burning and pile burning where feasible. A small amount of natural fuels treatments would be used to reduce hazards, improve rangelands, protect capital investments, and provide basket weaving materials.

## ECR Alternative

## Direct and Indirect Effects:

A minimal amount of timber-related fuels treatment would occur in this alternative. An emphasis would be on natural fuels treatment for hazard reduction and to return fuel

loadings to presuppression levels, especially during the initial transition period of 20-30 years. Other treatment methods besides burning would be used where economically and environmentally feasible.

Closing all level one roads will have the same consequences as in the CUR alternative. Minimum road standards for new roads could increase arrival times.

## LANDS PROGRAM MANAGEMENT

### Introduction

This section discusses the effects of the alternatives' Wild and Scenic River boundaries on the Small Tracts Act (STA) program. STA authority cannot be used to transfer lands within the National Wild and Scenic Rivers System, and areas of encroachment and mineral fractions not included in that System vary among alternatives.

### Assumptions Common to All Alternatives:

1. Encroachments are likely to have disturbed the land in a manner that is inconsistent with National Forest System management.

2. Encroached areas and mineral fractions that meet all qualifications for relief under STA will be conveyed into private ownership.

3. Encroached areas not meeting qualifications for relief under STA will not be economically viable for exchange under other authorities.

4. Settlement of encroachment cases other than through Small Tracts Act authority will require removing improvements and restoring lands to a near natural state within five years; interim use may be authorized by fee special use permit.

### Consequences Common to All Alternatives

The consequences of using Small Tracts Act (STA) authority to convey encroachments and mineral fractions into private ownership are not significant at the Forest plan level. The inability to use STA authority to convey encroachments found to be within a wild, scenic, or recreation river management area would, however, have major consequences on encroaching private landowners.

### Direct and Indirect Effects:

Conveying encroached areas to the adjoining land owner would not, in most cases, affect management objectives for the management area. Conveying them to the adjoining land owner would likely have fewer economic, social, and environmental consequences for the land owner, the Forest Service, and the land than would removing the encroachments and returning the land to a condition that would be compatible with management direction for the area.

Conveying mineral fractions that are more logical to manage as private lands into private ownership would not be likely to change existing land use patterns, would generally eliminate parcels that are inaccessible or otherwise difficult for the Forest Service to manage, would increase the local taxable land base, and would not affect management of the larger management area.

Using the exchange or interchange provision of the STA could result in the acquisition of lands desirable and suitable for National Forest management. Suitable private lands could be undeveloped or could be developed in a manner that is consistent with the management objectives for the area. Including such land in the National Forest System would not in most cases affect management of the area.

### Cumulative Effects:

The cumulative effects of the Wild and Scenic River boundaries on the Small Tracts Act program would be related to public perception of the Forest's ability to resolve innocent residential encroachments resulting from erroneous surveys in a manner that shows concern for local residents. The cumulative loss of small parcels of land from public ownership and management as part of the Wild and Scenic Rivers System would be relatively unnoticeable.

### Mitigations Common to All Alternatives

Standards and guidelines for use of Small Tracts Act authority would mitigate the effects of actions on other resources.

Individuals with encroachments on National Forest System lands within portions of the Wild and Scenic Rivers Systems that do not qualify for STA resolution would be given reasonable time to remove their improvements and return the land to a natural condition.

No additional mitigation measures were identified for specific alternatives.

## Consequences Specific to An Alternative

### CUR Alternative

### Direct and Indirect Effects:

Most of the encroachments resulting from erroneous surveys and mineral fractions fall within the half mile Wild and Scenic Rivers System corridor of the Trinity (main stem) and Klamath rivers. The encroached lands could be conveyed into private ownership under STA authority only after further evaluation and Plan amendment. Mineral fractions within these portions of the System could not be conveyed into private ownership under STA authority.

### Cumulative Effects:

The ability to negotiate and convey small parcels of innocently encroached land into private ownership would enhance the public perception of the Forest Service as an agency that is concerned about the local community.

### PRF and OGR Alternatives

### Direct and Indirect Effects:

Most of the encroachments resulting from erroneous surveys and mineral fractions are excluded from the Trinity (main stem) and Klamath river portions of the Wild and Scenic Rivers System. The encroached lands and mineral fractions remaining within the System could be conveyed into private ownership under STA authority only after further evaluation and Plan amendment.

### Cumulative Effects:

The ability to negotiate and convey small parcels of innocently encroached land into private ownership would enhance the public perception of the Forest Service as an agency that is concerned about the local community.

### MKT and ECR Alternatives

### Direct and Indirect Effects:

Most of the encroachments resulting from erroneous surveys and mineral fractions are outside the Trinity (main stem) and Klamath river portions of the Wild and Scenic Rivers System. The encroached lands and mineral fractions remaining within the System could not be conveyed into private ownership under STA authority. Costs to the Forest Service and encroachment owner to obtain removal of improvements would likely be greater than costs of negotiating Small Tracts Act resolution. Requests from individuals for Congressional action to provide relief or amend the Small Tracts Act could increase, creating some additional burden for Forest Service response.

### Cumulative Effects:

Perception of the Forest Service as an agency that is inflexible and unable to negotiate relief for innocent encroachers would increase in affected communities.

# RANGE MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issue.

Issue 22 How should the Forest manage the range resource?

Environmental consequences to rangelands are based on how management techniques can affect the production and ecological condition of plant communities. Consequences for grazing use are quantified by the potential animal unit months (AUMs) of forage available for livestock and wildlife use and the potential animal months (AMs) of livestock use made available under various management practices. Other effects are described in terms of expected changes in ecologic conditions.

The Forest, after allowing for deer use, identifies 12,043 AMs available on the Lower Trinity and Mad River Ranger Districts. The average annual livestock use attributable to National Forest System lands in 1988 and 1989 averaged 6,609 AMs. This figure is used in this chapter for calculating outputs and estimating effects. See the Economic section for projected outputs, costs, and employment attributable to range management.

## Assumptions Common to All Alternatives:

Major impacts on rangeland vegetation and its use are:

## Grazing:

Forage on the Forest is available to livestock and wildlife. Livestock permittees rely on the Forest for seasonal supplies of forage. Hunters desire to maintain or increase the number of deer and support an elk reintroduction program.

## Timber Management:

Timber harvesting opens the forest canopy, creating transitory range. Transitory range presently makes available 2,206 AMs for livestock. Timber sale quantity and silvicultural strategy affect the forage available for livestock and wildlife. The more open the forest canopy, the higher the forage production, nutrient value, and palatability. Transitory range has the potential to decrease grazing pressure on primary and secondary range types, possibly improving the desired condition.

## Range Improvements:

Structural range improvements improve livestock distribution and promote more uniform utilization of forage. Constructing improvements (mostly fences and water developments) is a key component of range management strategies for improving ecologic condition. Nonstructural range improvements can alter the vegetative expression of rangeland. The implementation of nonstructural improvements (burning, seeding, mechanical and biological treatment, and herbicides) can reduce the presence of undesirable vegetation, such as introduced species, and convert the plant community to assemblages of species that are consistent with management objectives.

## Riparian:

Riparian areas are diverse and productive range sites which are often over-utilized by livestock in comparison to upland sites, probably due to the access to water, shade, and thermal cover, and the quality and variety of forage. Riparian resource values will be preserved and management of livestock adjusted to conform to riparian reserve management area direction and Forest standards and guidelines.

## Wilderness:

Wilderness users often feel that the presence of livestock detracts from their wilderness experience. The livestock allotments that were present prior to classification as wilderness are permitted to remain.

## Roads:

Road construction may create access for livestock into areas previously unsuitable, and may lead to trespass into adjacent allotments. The construction of roads may require the installation of fences, gates, and cattleguards (at the time of road construction) to prevent trespass.

## Consequences Common to All Alternatives

### Direct, Indirect, and Cumulative Effects:

Forage production on permanent range, as measured by AUMs, would be expected to remain fairly constant. AUMs available on transitory range would vary depending on timber sale quantity, silvicultural strategy, location, and accessibility. Mitigation measures to protect other resources, such as soil, water, fish, and wildlife, are common to all alternatives to the extent that livestock use is allowed, and there would be no difference in the nature of the impacts of grazing on other resources among alternatives. No cumulative effects were identified as being common to all alternatives.

### Mitigations Common to All Alternatives

The necessity to protect and/or mitigate the effects of grazing upon unique resource attributes, such as cultural resource attributes, and threatened and endangered species habitats, which are protected under federal and state statute, would not vary among alternatives. For example, under all of the alternatives considered, except the ECR alternative, rangeland project decisions (RPDs) would integrate the actions needed to manage rangeland resources for livestock grazing, soil and watershed protection, wildlife and fisheries, recreation, and other resources. RPDs identify the amount of forage available for wildlife and livestock use and specify methods for controlling when, where, and in what numbers livestock may be grazed. RPDs would be completed based upon available funding and according to the schedule in Plan Appendix F.

Structural and nonstructural range improvements should maintain or improve the ecological condition of rangelands. Structural improvements would aid in distribution of livestock and wildlife, promoting more even utilization of vegetation. Nonstructural improvements could alter vegetative composition of plant communities.

Road construction within allotments would be mitigated through the use of standards and guidelines applicable to the transportation system.

No additional mitigations specific to an alternative were identified.

## Consequences Specific to An Alternative

### CUR Alternative

### Direct, Indirect, and Cumulative Effects:

The amount of transitory range would increase by the fifth decade due to timber harvest activities, increasing the carrying capacity for livestock and wildlife. Vacant allotments would be filled as need is demonstrated. Range outputs would increase about 68 percent from current levels by the fifth decade as vacant allotments are filled and the amount of transitory range increases. Conflicts such as those between livestock and wilderness users would continue and would increase in proportion to increases in recreation use.

Road construction might create access to previously unsuitable rangeland, resulting in livestock drifting off permitted allotments. Riparian standards and guidelines could preclude the present level of livestock use on localized sites, but should not greatly affect grazing. Implementing range improvements would maintain and could improve the ecological condition of the rangelands.

### PRF Alternative

### Direct, Indirect, and Cumulative Effects:

Livestock use would remain near present levels, well below the forage capacity produced. The AMs presently not being utilized on the Forest could be used to decrease pressure on primary range and offset actions required to provide protection to all rangeland resources. Conflicts such as those between livestock and wilderness users would continue and could increase in proportion to increases in recreation use.

Road decomissioning might reduce the potential for livestock drifting off permitted allotments. Riparian standards and guidelines could preclude the present level of livestock use on localized sites, but should not greatly affect grazing. Implementing range improvements and other management strategies and maintaining current stocking rates would improve the ecological condition of rangelands.

## OGR Alternative

### Direct, Indirect, and Cumulative Effects:

Livestock use would decrease about eight percent from present levels by the second decade, due to closing wilderness to livestock, and then would remain fairly constant. Effects would be comparable to those for the PRF alternative, except that effects in Wilderness would be the same as for the ECR alternative after the first decade.

## MKT Alternative

### Direct, Indirect, and Cumulative Effects:

Transitory range would be increased through timber harvest activities. Livestock use would increase about 129 percent from present levels by the end of the fifth decade. All allotments would be fully stocked. There would be more conflicts between recreational users and livestock. Permittees could be required to install more structural improvements and provide more intensive management to maintain the ecological condition of rangelands. Road construction might create access to previously unsuitable rangeland, resulting in livestock drifting off permitted allotments.

## ECR Alternative

### Direct, Indirect, and Cumulative Effects:

Livestock use of rangelands would be phased out over the first decade as permits expire. Livestock conflicts with wilderness users and other recreationists would be eliminated. Livestock would not affect riparian and aquatic areas. Permittees would not be available to maintain water developments that would benefit wildlife. The effect of roads upon livestock distribution would not be a concern. Ending livestock use after the first decade would improve the ecological condition of rangelands
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# RECREATION PROGRAM MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issues:

Issue 23 How much of the Forest will be opened to off-highway vehicles?

Issue 24 How many miles of trails will be constructed and maintained on the Forest?

Issue 25 How will more recreational opportunities be provided?

Impacts to the recreation resource would vary through the range of alternatives. Impacts are the result of management activities such as timber harvesting or road construction that affect the quality of the recreation setting. Alternatives also affect the availability of recreation opportunities and the Forest's ability to provide them in varying ways. These effects are demonstrated through the changes in recreation capacity and acreages of various ROS (Recreation Opportunity Spectrum) classes by alternative. It is not expected that the various alternatives would have a major influence on overall recreation use.

Proposed recreation opportunity spectrum (ROS) classes are linked to compatible management strategies assigned to specific alternatives. Refer to the ROS Appendix and the ROS Map contained in the map packet for additional information on the various ROS classes. Differences among alternatives occur with respect to acres managed for different combinations of semi-primitive non-motorized, semi-primitive motorized, and roaded natural ROS classes. These differences are described in the consequences specific to an alternative. There are also differences among alternatives in the intensity of recreation management according to the theme of the alternatives; the differences are reflected primarily by various levels of recreation site rehabilitation, trail maintenance, and trail construction.

There currently are no areas open to off-highway vehicles (OHV). Some areas, such as designated wildernesses, are closed to all motorized use. Otherwise, OHV use is restricted to designated routes. OHV use opportunities will vary by the amount of OHV routes designated or constructed and by the

amount of level 2 roads maintained as well as by the amount of non-motorized areas provided outside of wilderness. The amount of trail miles maintained will vary in frequency and by the amount of additional miles constructed by alternative. The opportunities for additional dispersed recreation experiences will vary by the ROS classes provided and the miles of road constructed and maintained open.

## Consequences Common to All Alternatives

### Direct and Indirect Effects:

The majority of recreational use would be in developed recreational sites or would consist of dispersed recreation use in river corridors and along principal roads and trails. All alternatives would meet the demand for developed and dispersed recreational opportunities through the fifth decade.

None of the alternatives would provide any open areas of OHV use. All alternatives would control OHV use by restricting such use to designated routes. OHV opportunities would be managed to protect resources, promote safety, and minimize social conflicts.

The entire area within the boundaries of designated wildernesses would be managed for the primitive ROS class under all alternatives. The acreage of rural ROS classes remains the same throughout all alternatives. Refer to Table IV-31 for a comparison of ROS acres and capacity by alternative.

Major facility construction would occur only within the Smith River National Recreation Area as indicated in the NRA Plan. Only minor site construction would occur elsewhere.

### Cumulative Effects:

There are no known cumulative effects related to recreation.

## Mitigations Common to All Alternatives

No mitigations were identified for this resource.

## Consequences Specific to An Alternative

Table IV-30 displays the comparison of ROS acres and capacity by alternative. Other direct and indirect effects are discussed by alternative.

## CUR Alternative

### Direct and Indirect Effects:

Approximately 25 percent of all developed sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Trails would be maintained on the average of once every 4 years at a minimum standard. Approximately 10 miles of trails would be constructed/reconstructed during the first decade. Eventually, recreational facilities and trails would not meet user expectations.

Designated OHV routes would increase slightly and would consist primarily of maintenance level 2 roads; miles of level 2 road would increase from 1192 to 1195 miles at the end of decade 1.

All roads in the North Fork Smith River Botanical Area would be open to high clearance vehicle access. Gates would be closed in the wet season. Motorized recreation opportunities would be foregone in the area during the wet season; as most use occurs during the dry season, this alternative would have minor negative effects to most motorized recreationists using the area. However, the North Fork Smith area is used for big game hunting in the fall. As it is often raining during this hunting season, opportunities for big game hunting in the area would be largely foregone.

About 168,910 acres (18 percent of the Forest) would be available for primitive and semi-primitive non-motorized recreational opportunities. Approximately 779,000 acres (81 percent of the Forest) would be available for semi-primitive motorized and roaded natural recreational opportunities.

## PRF Alternative

### Direct and Indirect Effects:

Approximately 50 percent of the developed sites would be rehabilitated during the first decade to respond to changing user needs and accessibility requirements. Reconstruction and construction of new facilities would consider the needs of impaired individuals and a multicultural society.

The development of recreational facilities within riparian reserves would be restricted in order to attain aquatic conservation strategy objectives. Trails would be located outside riparian reserves where possible to minimize the effects on aquatic and riparian-dependent

resources. Existing trails and facilities within riparian reserves would be evaluated to ensure that they do not prevent attainment of the aquatic conservation strategy objectives.

Trails would be maintained on the average of once every 3 years. Approximately 16 miles of trails would be constructed/reconstructed during the first decade. Trails would be maintained to standard levels. Trail management would expand to include management for equestrian use and mountain bikes.

Staging areas to facilitate OHV use would be constructed during the first decade. Designated OHV routes would decrease slightly and would consist primarily of level 2 roads; miles of level 2 road would decrease from 1192 to 1183 miles at the end of decade 1.

In the North Fork Smith River Botanical Area, FS Road 18N13 would be closed to vehicle access. Vehicle access into remaining areas would be controlled by permit. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

This alternative would be similar to the ECR alternative in terms of road closures and permit requirements in the North Fork Smith River Botanical Area, and would have similar effects for motorized recreationists. In addition, as FS Road 18N13 would be closed to vehicle access, there would be no motorized access to the lookout site. Recreationists would need to walk approximately 1.5 miles (a very steep climb) to the lookout site from Road 18N09.

To offset these effects, the Forest would provide information about the road closures and permit system in the North Fork Smith River Botanical Area to the public and user groups, and would also post this information along roads leading to access points to prevent inconveniences to users. The Forest would identify other opportunities for OHV use in the Smith River NRA.

About 238,060 acres (25 percent of the Forest) would be available for primitive and semi-primitive non-motorized recreational opportunities. Acreage available for semi-primitive non-motorized opportunities outside wilderness would increase from the current situation by 69,150 acres (40 percent), mainly due to the increased number of roadless areas remaining roadless. Approximately 710,520 acres (74 percent of the Forest) would be available for semi-primitive motorized and roaded natural recreational opportunities. This represents a decrease of 69,150 acres (8 percent) from the current situation.

## OGR Alternative

## Direct and Indirect Effects:

The consequences regarding facilities, trails, and OHV use would be the same as the PRF alternative. Designated OHV routes would decrease slightly and would consist primarily of level 2 roads; miles of level 2 road would decrease from 1192 to 1188 miles at the end of decade 1.

In the North Fork Smith River Botanical Area, no vehicle access would be allowed from Diamond Creek to the Gasquet Toll Road (County Road 314), except under an approved annual mining plan of operations and for administering approved mining operations. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

All motorized recreational opportunities from Diamond Creek to the Gasquet Toll Road would be foregone in this alternative. This would have negative effects for a number of different recreationists, including: OHV users, particularly those who have historically used the roads in the area; hunters; and those who visit the area for its historic mining, botanic, and scenic values. There would be opportunities to develop the area for backcountry recreation.

About 176,320 acres (18 percent of the Forest) would be available for primitive and semi-primitive non-motorized recreational opportunities. Acreage available for semi-primitive non-motorized opportunities outside wilderness would increase from the current situation by 7,410 acres (4 percent), mainly due to the increase in reserved areas under this alternative. Approximately 772,260 acres (81 percent of the Forest) would be available for semi-primitive motorized and roaded natural recreational opportunities. This represents a decrease of 7,410 acres (1 percent) from the current situation.

## MKT Alternative

## Direct and Indirect Effects:

The consequences regarding facilities, trails, and OHV use would be the same as the CUR alternative.

Designated OHV routes would increase slightly and would consist primarily of level 2 roads; miles of level 2 road would increase from 1192 to 1196 miles at the end of decade 1.

Vehicle access in the North Fork Smith River Botanical Area would be controlled by permit. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

This alternative would require a permit for vehicle access on roads 18N09, 18N13, and associated spur roads. As in the CUR alternative, the MKT alternative primarily affect big game hunters as a result of road closures during the wet season. This alternative would inconvenience those motorized recreationists who, not knowing of the need for a permit for vehicle access to the area, could arrive at access points without a permit. These recreationists would need to drive to the NRA office in Gasquet to get a permit in order to get vehicle access to the area, resulting in time delays in their recreational experience. This alternative would also inconvenience users who arrive at access points during the summer and find that the roads are gated because of heavy rains.

To offset these effects, the Forest would provide information about the road closures and permit system in theNorth Fork Smith River Botanical Area to the public and user groups, and would also post this information along roads leading to access points to prevent inconveniences to users.

About 148,650 acres (16 percent of the Forest) would be available for primitive and semi-primitive non-motorized recreational opportunities. Acreage available for semi-primitive non-motorized opportunities outside wilderness would decrease from the current situation by 20,260 acres (11 percent), mainly due to the decrease in reserved areas under this alternative. Approximately 799,930 acres (83 percent of the Forest) would be available for semi-primitive motorized and roaded natural recreational opportunities. This represents an increase of 20,260 acres (3 percent) from the current situation.

## ECR Alternative

## Direct and Indirect Effects:

The consequences regarding facilities, trails, and OHV use would be the same as the CUR and MKT alternatives.

Designated OHV routes would increase slightly and would consist primarily of level 2 roads; miles of level 2 road would increase from 1192 to 1195 miles at the end of decade 1.

In the North Fork Smith Botanical Area, FS Road 18N13 from the lookout to County Road 315 would be closed to vehicle access. Non-system roads off 18N13 from 18N09 to the lookout site would be closed. Vehicle access into remaining areas would be controlled by permit. Access would not be allowed during the wet season and during periods of heavy rain in the summer.

As in the CUR and MKT alternatives, the ECR alternative would primarily affect big game hunters as a result of road closures during the wet season. As in the MKT alternative, this alternative would inconvenience some motorized recreationists who are unaware of the need for a permit or the road closure policy for periods of heavy rain during the summer. Opportunities for driving the loop from Diamond Creek to the Gasquet Toll Road would be foregone; this would have negative effects on OHV users, particularly those who have historically driven this loop.

To offset these effects, the Forest would provide information about the road closures and permit system in the North Fork Smith River Botanical Area to the public and user groups, and would also post this information along roads leading to access points to prevent inconveniences to users. The Forest would identify other opportunities for OHV use in the NRA.

About 147,190 acres (15 percent of the Forest) would be available for primitive and semi-primitive non-motorized recreational opportunities. Acreage available for semi-primitive non-motorized opportunities outside wilderness would decrease from the current situation by 21,720 acres (13 percent), mainly due to the large managed land base in this alternative. This alternative would not have any semi-primitive non-motorized areas outside of wild river corridors. Approximately 801,390 acres (84 percent of the Forest) would be available for semi-primitive motorized and roaded natural recreational opportunities. This represents an increase of 21,720 acres (3 percent) from the current situation.

## ROADLESS AND WILDERNESS AREA MANAGEMENT

### Introduction

This section discusses the effects of alternatives in relation to the following issues:

Issue 26 How should released roadless areas (RARE II) be managed?

Issue 28 Should the Forest establish additional areas for wilderness management

All areas not designated by Congress for wilderness or further planning in the 1984 California Wilderness Act were "released" for multiple-use resource management, exclusive of wilderness management. As the capacity of the Forest's wilderness areas exceeds current and projected demands, no further areas are proposed for wilderness in this final EIS and Plan. The remaining roadless areas will be subject to future review for possible wilderness classification when the Forest Plan is revised in 10 to 15 years. Therefore, the amount of areas retained in a natural condition with primitive recreation opportunities is an important consideration. There are 10 remaining roadless or RARE II areas of 117,150 acres. This reflects a reduction from the original Roadless or released RARE II areas due to subsequent roading and timber sale impacts. See Appendix C of the FEIS for site-specific descriptions of the Roadless and RARE II areas.

No roadless or RARE II areas are proposed for management to specifically retain their current wilderness attributes; all of the areas are being proposed for non-wilderness strategies. Some of the roadless or RARE II areas are in management areas or have management strategies that will maintain the roadless areas in a condition likely to retain their wilderness attributes.

### Assumptions Common to All Alternatives:

1. Those strategies that provide for road building and timber harvesting have the potential to alter or change the current wilderness attributes.

2. Management areas such as research natural areas, special interest areas, special habitat or riparian reserves that do not provide for regulated timber harvesting would retain or only slightly alter the wilderness attributes.

3. This Rare II analysis assumes that if an area is available for certain silvicultural strategies and road construction, wilderness attributes could be reduced or eliminated. This assumption was made because of the lack of spacial modeling analysis in regard to timber sale locations. This analysis therefore represents a worst case situation for each alternative, because it is unlikely that all of the lands that allow timber harvest would be impacted during the first 10-15 years.

### Consequences Common to All Alternatives

### Direct and Indirect Effects:

Some management areas and their associated silvicultural strategies have potential to alter the area to a degree that would forego the future wilderness opportunities, while others would maintain closely the current setting, natural condition, and other wilderness attributes that would allow the area to be considered for wilderness classification during the Forest Plan revision.

Most of the roadless areas within the Smith River National Recreation Area (NRA) have the same silvicultural strategies applied in all alternatives. Four roadless areas within the NRA occur within management areas having no programmed timber harvest. It is assumed that these areas are likely to retain their existing characteristics, and wilderness opportunities would not be foregone. These areas are: South Kalmiopsis (Six Rivers portion of entire area: 370 acres), Siskiyou "B" (the portion of the area within the non-timber management zone and wild river corridor: 16,600 acres), North Fork of Smith River (entire area: 30,330 acres), and Kelly (the portion of the area within a non-timber management zone: 5,130 acres). As a result, all alternatives have at least four roadless areas totaling 52,430 acres in which it is likely that the existing wilderness attributes would be retained. There is one other roadless area (Ship Mountain) that occurs within a timber management zone of the NRA; silvicultural strategies for it vary by alternative, and effects are discussed in the next section.

### Cumulative Effects:

There are no known cumulative effects related to roadless and wilderness areas.

## Mitigations Common to All Alternatives

There are no mitigations prescribed specifically for maintaining wilderness attributes for any alternative.

## Consequences Specific To An Alternative

Those prescriptions that have the potential to eliminate, reduce, or retain the wilderness attributes are shown in Table IV-31. Some of the prescriptions vary by alternative; thus, in some cases similar management area prescriptions have different effects depending upon the alternative. Table IV-32 shows the aggregation of total acres by various management prescriptions. This can be used in conjunction with Table IV-31 for an indication of potential acres that would retain or lose wilderness attributes. Actual acres would be somewhat less due to fragmentation of areas and reductions in size of unaffected areas to less than 5,000 acres. The chart in Figure IV-18 is a graphic representation of Table IV-32, showing net acres subject to development and acres in which the wilderness attributes are likely to be retained or only slightly altered. Table IV-33 is an area specific table that shows the prescription allocation by alternatives; it is the basis of the following alternative and roadless area specific discussion.

## CUR Alternative

## Direct and Indirect Effects:

In addition to the 4 areas within the NRA discussed above, this alternative would maintain the wilderness attributes of Ship Mountain (5,680 acre portion), Orleans “B” (4,740 acre portion), Orleans “C” (7,290 acre portion), and Blue Creek (4,100 acre portion). This alternative contains 74,240 acres in 8 areas in which it is likely that wilderness attributes would be retained or only slightly altered.

Roadless or RARE II areas in which wilderness opportunities would likely be foregone are Slide Creek, Cow Creek, and portions of Ship Mountain (4,520 acres), Orleans “B” (12,480 acres), Orleans “C” (5,100 acres), and Blue Creek (8,050 acres).

## PRF Alternative

## Direct and Indirect Effects:

This alternative would maintain the greatest amount of roadless areas in a condition likely to retain their wilderness attributes. Those roadless areas in key watersheds would have no new road construction, and would be managed as semi-primitive non-motorized areas under the ROS system. Watershed analysis would be required in all key and non-key watersheds containing roadless areas prior to management activities within the roadless areas. Stand management in late-successional reserves (LSRs) would focus on accelerating the development of late-successional stand characteristics and protecting stands from catastrophic disturbances, and would be accomplished through helicopter logging in key watersheds. As this management strategy would closely maintain the natural integrity and apparent naturalness of the area, the wilderness attributes of roadless areas in LSRs would be retained or only slightly altered.

In addition to the 4 areas within the NRA discussed above, this alternative would maintain the wilderness attributes of Ship Mountain (7,890 acre portion), Slide Creek (11,490 acre portion), Orleans “B” (13,770 acre portion), Orleans “C” (12,290 acre portion), Blue Creek (11,890 acre portion), and Cow Creek (740 acre portion). This alternative contains 110,500 acres in 10 areas in which it is likely that wilderness attributes would be retained or only slightly altered.

Roadless areas within key watersheds would have a ROS classification of semi-primitive non-motorized; these areas include South Kalmiopsis, Siskiyou “B”, North Fork Smith, Kelly, Ship Mountain, Slide Creek, Blue Creek, and portions of Orleans “B”. In addition to the 110,500 acres retained as described above, additional acreages in these roadless areas would remain roadless. Timber harvesting and other management activities would require a watershed analysis, and would be based on the direction for specific management areas. The wilderness attributes of these areas would be somewhat reduced, but would not be eliminated. These areas include Siskiyou “B” (1,160 acres), Kelly (180 acres), Ship Mountain (2,300 acres), Slide Creek (220 acres), Blue Creek (270 acres) and Cow Creek (160 acres). This alternative contains 4,290 acres in 6 areas in which it is likely that the wilderness attributes would be somewhat reduced but would not be foregone. In addition, a semi-primitive

non-motorized ROS designation would be given to Board Camp (4,530 acres) and the remaining roadless portion of Underwood (3,000 acres).

Portions of roadless or RARE II areas in which wilderness opportunities would likely be foregone are Orleans "B" (3,450 acres), and a small area of Orleans "C" (90 acre portion).

## OGR Alternative

### Direct and Indirect Effects:

The alternative would maintain the second highest amount of roadless areas in a condition likely to retain their wilderness attributes. This is because of the large acreage of old growth reserves in the special habitat management area that overlap with these areas. In addition to the four NRA areas, this alternative would maintain the attributes of: Ship Mountain (6,710 acres), Slide Creek (11,190 acres), Orleans "B" (15,840 acre portion), Orleans "C" (entire 12,390 acre area), Blue Creek (11,950 acres), and Cow Creek (840 acres). This alternative contains 111,350 acres in 10 areas in which wilderness attributes would be retained or only slightly altered.

Portions of roadless or RARE II areas in which wilderness opportunities would likely be foregone are Ship Mountain (3,480 acres), Orleans "B" (1,380 acres), and small portions of Slide Creek (510 acres), Blue Creek (270 acres), and Cow Creek (60 acres).

## MKT and ECR Alternatives

### Direct and Indirect Effects:

These alternatives would maintain the least amount of roadless areas in a condition likely to retain their wilderness attributes. This is due to the greater number of acres in the general forest management area and other areas with timber management, and lesser number of acres in reserves such as the special habitat management area. In addition to the four NRA areas, these alternatives would maintain the attributes of Ship Mountain (5,680 acre portion) and Orleans "C" (7,290 acre portion). These alternatives contain 65,400 acres in six areas in which it is likely that wilderness attributes would be retained or only slightly altered.

Opportunities would be foregone in Slide Creek, Orleans "B", Blue Creek, Cow Creek, and in portions of Ship Mountain (5,380 acres) and Orleans "C" (5,730 acres).

# WILD AND SCENIC RIVERS MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issues:

Issue 29 Will other rivers be assessed for inclusion in the National Wild and Scenic Rivers System?

Issue 30 What will be the boundaries for the rivers in the Wild and Scenic Rivers System?

There are currently 95.25 miles of designated wild rivers, 42 miles of designated scenic rivers, and 229 miles of designated recreational rivers, for a total of 366.25 miles, on the forest.

An analysis of wild and scenic river candidates was completed and is described in Appendix D of this FEIS. Redwood Creek was found to possess a potential outstandingly remarkable scenic value. Blue Creek and Red Mountain Creek were found to possess a number of potential outstandingly remarkable values. A suitability study will be performed on these rivers after completion of the final EIS and Forest Plan.

The wild and scenic rivers stream segments in the Smith River NRA will be those designated in the Smith River NRA Act, and the corridor widths will be those identified in the Smith River NRA Management Plan, as provided in the Act. These corridors will be managed as provided in the NRA Act and Management Plan. Environmental consequences and mitigations for these streams were discussed in that plan and are not discussed further here.

The corridors for the South Fork of the Trinity will be those established in the South Fork of the Trinity Wild and Scenic River Management Plan. They will be managed as provided in that plan. Environmental consequences and mitigations for the South Fork Trinity were discussed in that plan and are not discussed further here.

## Assumptions Common to All Alternatives:

1. All designated rivers will be managed under the direction of founding legislation and existing river management plans.

2. The management of the wild and scenic river segments outside the Smith and South Fork Trinity will be evaluated in individual river management plans.

## Consequences Common to All Alternatives

### Direct and Indirect Effects:

Lands within wild river corridors would maintain the natural conditions of the forest ecosystem: no new mineral entry would be allowed; timber harvest is generally unacceptable; construction of major recreation and hydroelectric facilities, roads, powerlines, and other features is prohibited.

Lands within scenic river corridors would retain their natural forest condition as seen from the river, although the degree of development, types of land use, and accessibility would vary. Timber management and mineral entry would be constrained by retention visual quality standards. No major recreation facilities would be constructed.

Recreational river corridors are within more restrictive management areas in all alternatives and would be managed according to the specific management area direction.

The anadromous fisheries values for which the rivers were designated would be protected through riparian reserve management area direction.

### Cumulative Effects:

There are no known cumulative effects relative to wild and scenic rivers.

## Mitigations Common to All Alternatives

The potential outstandingly remarkable values for Redwood Creek, Blue Creek and Red Mountain Creek will be protected during this planning period in a condition that will not diminish their potential for future wild and scenic river consideration.

No other mitigations related to specific wild and scenic rivers were identified for any alternative.

## Consequences Specific to an Alternative

Corridor widths on designated wild and scenic rivers in the Klamath, North Fork Eel, and segments of the Trinity rivers vary by alternative. Allowances for boundary adjustments also vary by alternative. These direct and indirect consequences are discussed below. See the Lands section of this Chapter for the impacts of the varying corridor widths related to potential actions under the Small Tracts Act. No other known consequences would occur.

## CUR Alternative

### Direct and Indirect Effects:

The corridor width would be a quarter mile from each bank of the Klamath, Trinity, and North Fork Eel river segments; this would include all private lands within the quarter mile, although acreages for private lands are not shown in this document. Recreational river corridors on the Klamath and Trinity rivers would fall within both the riparian reserve and the retention management areas; management restrictions for these management areas would apply within the corridors. No regulated timber management would occur within riparian areas (approximately 300 feet each side of the corridor); marginal timber yields occur in retention areas, and the harvest methods used in retention areas would not deter from the scenic quality within the corridors. As the corridors would be within these more restrictive management areas, there would be no major loss of timber and other outputs from the approximately half mile corridor width designation.

The Forest Plan could be amended to adjust wild and scenic river boundaries in order to permit sale, exchange, or interchange of encroached parcels under STA authority. Such amendments would only occur when conveying National Forest System lands into private ownership would not cause additional impacts to the corridor. The Forest Plan could also be amended to adjust the river boundaries in order to include private lands acquired through STA authority. It is likely that less than 25 acres of encroached land would be excluded from the Wild and Scenic Rivers System by Plan amendment and conveyed into private ownership.

## PRF and OGR Alternatives

### Direct and Indirect Effects:

The recreational river corridor widths for the Klamath and Trinity segments would follow the riparian reserve management area boundary, with exceptions for private lands and known encroached areas and mineral fractions qualifying for STA conveyance. The wild river segment of the North Fork Eel would be approximately a quarter mile from each bank of the river and would be based on viewshed considerations, with adjustments for private lands and wilderness. The size of the North Fork Eel corridor on Forest Service lands would be the largest in these alternatives; 100 acres larger than in the CUR alternative and 1,290 acres larger than in the MKT and ECR alternatives. As the areas within and adjacent to the recreational river corridors would be in management areas such as riparian reserves and retention which are more restrictive, there would be few risks to these river segments from having corridor widths less than a quarter mile on each side of the river.

The Forest Plan could be amended to adjust wild and scenic river boundaries in order to permit sale, exchange, or interchange of encroached parcels and mineral fractions under STA authority. Such amendments would only occur when conveying National Forest System lands into private ownership would not cause additional impacts to the corridor. The Forest Plan could also be amended to adjust the river boundaries in order to include private lands acquired through STA authority. It is likely that less than 10 acres of encroached land would be identified in the future and could be excluded from the Wild and Scenic River System by Plan amendment and conveyed into private ownership.

## MKT and ECR Alternatives

### Direct and Indirect Effects:

The corridor width would be 300 feet from each bank of the recreational segments of the Klamath and Trinity and the wild segment of the North Fork Eel. The recreational segments of the Klamath and Trinity would fall within the riparian reserve management area. The wild segment of the North Fork Eel would be the smallest in this and the ECR alternative; 1,290 acres smaller than in the PRF and OGR alternatives, and 1,190 acres smaller than in the CUR alternative. As the areas within the recreational river corridors would be in management areas which are more restrictive, there would be few risks to these river segments within the corridor. In the MKT alternative, the areas adjacent to the recreational river corridors would be in the retention management area, and there would be little risk to these river segments from having corridor widths less than a quarter mile. In the ECR alternative, the areas adjacent to the recreational river corridors would be in the general forest management area, and there is a risk of having modified viewsheds from the reduction in corridor width. For both alternatives, there is a risk of having modified viewsheds adjacent to the wild river corridor on the North Fork Eel from the reduction in corridor width.

The Forest Plan could not be amended to adjust wild and scenic river boundaries in order to permit conveyance under STA authority, and no encroached land could be conveyed into private ownership unless the Small Tracts Act is amended to allow its use in Wild and Scenic River corridors.

# TIMBER MANAGEMENT

## Introduction

This section discusses the effects of alternatives in relation to the following issues:

Issue 2 What level of annual timber harvest will the Forest make available to help provide for the economic base of local communities?

Issue 31 How will hardwoods be utilized?

**Timber Harvest Level:** This issue concerns annual timber harvest levels and the economic value of the harvest. This section presents annual harvest levels for each alternative.

**Hardwood Management and Utilization:** This issue deals with both maintenance of hardwoods as a natural forest component and the availability of hardwoods for firewood, biomass, or lumber. The Biological Diversity section addresses the effects of the alternatives on the extent and distribution of hardwood forest communities. This section discusses how various management practices would affect hardwood stands and how these practices would affect the availability of hardwoods as a forest product.

## Assumptions Common to All Alternatives:

**1**. The timber harvest level is equivalent to the allowable sale quantity (ASQ), which represents the maximum volume of timber the Forest may sell over a given period or, in this case, over the 10 year planning period. The ASQ is generally expressed in terms of the average volume of timber sold annually. The actual volume sold may fluctuate somewhat around this average and is dependent upon the Forest budget. For purposes of discussion, the volume of timber sold annually is considered equivalent to the volume harvested. Because of the use of multi-year contracts, the actual volume harvested may deviate from the volume sold in a given year. Economic value is derived from the price paid to the government for timber minus the cost of preparing and administering timber sales, constructing roads, and reforesting harvested sites. A present net value analysis of the alternatives and an analysis of the social effects are included in the Social and Economic sections.

The ASQ indicates what quantities of timber are available from lands suitable for timber harvest. It does not include timber harvested from unsuitable lands. ASQ is dependent on the quantity of suitable land available, the productivity of these lands, and the management strategy applied.

2. None of the alternatives meet the 1990 Resource Planning Act (RPA) timber program goals issued May, 1990. Lands set aside for the protection of Threatened, Endangered, and Sensitive plant and animal species, and the establishment of the Smith River NRA substantially reduce the number of acres available for timber management.

3. Herbicides are a potential management tool for all alternatives. In some instances, pesticides may be needed to achieve the desirable mix of plant species. Some areas may not be regenerable without the use of herbicides, where competing vegetation cannot be controlled by manual methods.

## Consequences and Mitigations Common to All Alternatives

## Timber Harvest Level:

**Direct and Indirect Effects:** The ASQ in all alternatives is significantly reduced compared to 1980 harvest levels on the Forest. The ASQ proposed for each alternative is shown in Table II-14 and ranges from approximately 11 to 68 percent of the average amount sold during the 1980s (139 MMBF). This reduction is a result of the decreased amount of land available in all alternatives for timber management and the less intensive timber management strategies applied (see Tables II-15, II-16 and Figures II-2, II-3).

On lands where timber management may occur, proposed harvest levels in all alternatives are well below the productive capacity of the land to grow wood products. Alternatives that would allocate a greater number of acres for timber management and/or have more acres under intensive timber management would have the greatest increases in forest growth and long-term sustained yield of timber harvest. Since, in all alternatives, only a small portion of total Forest acres would emphasize timber management, the Forest would grow more timber than is harvested. This would result in an increase in timber inventory compared to the current condition, with a greater

proportion of acres in older seral stages with lower levels of growth.

All alternatives would have some green trees left after regeneration harvesting. These trees reduce both the volume available for harvest and the growth of the next stand. The effects would vary by the number of trees left, whether these trees are clumped together or scattered throughout the unit, the length of time between harvests, and the quality of the growing sites. Reduction in harvest volumes would range from 15 to 50 percent. Future stand growth would be reduced by an estimated 15 to 25 percent. Most alternatives would have rotations that are longer than previous management strategies. They would also have fewer, longer intervals between commercial thinnings. These factors would contribute to lower harvest levels, decreased forest growth, and increased stand mortality.

The inventory and growth of lands could vary as a result of wildfire, salvage operations, and reforestation. On lands suitable for timber management, aggressive salvage and reforestation would occur. On lands unsuitable for timber management, the amount of salvage and reforestation that would occur following fire, or other widespread disturbance, would vary depending on the management area and interdisciplinary analysis.

**Cumulative Effects:** Cumulative effects of timber harvest on other environmental, economic, and social components are discussed in those sections of this chapter. Reduced harvest of timber from the National Forest may contribute to higher costs for wood products, an increase in harvest levels from private land owners, and an increase in the amount of wood products that are imported to California. No additional cumulative effects specific to an alternative were identified.

**Mitigations:** No mitigations were identified for any alternative relative to timber harvest level.

## Hardwood Management and Utilization:

**Direct and Indirect Effects:** Hardwood management on unsuited lands would be similar for all alternatives. Hardwood plant associations would be maintained as part of the landscape vegetation mosaic and provide habitat for wildlife, fungi, and other organisms. The alternatives differ in the management of hardwoods within the timber suited land base. Hardwood management is not emphasized on lands managed for timber, but each alternative proposes a different level of hardwood retention for these lands. In all alternatives, utilization of hardwoods for commercial products would be encouraged to the extent that these operations are compatible with the goals and objectives of the alternative. Opportunities to utilize noncommercial wood products would be determined on a project level basis and are subject to many of the same restrictions which limit conifer harvest.

A current inventory or output of potential hardwood volume by alternative was not estimated for this plan. Since lands managed for timber production also provide the greatest opportunity for hardwood utilization, the availability of hardwood products would decrease under all alternatives. Personal-use and commercial hardwood sales would continue to be focused on utilization of logging residue, fallen trees, and trees along roads. There would be some opportunity to provide hardwood to commercial users from alternate sources, such as from regeneration or selective cutting in hardwood or mixed conifer stands. However, reductions in lands where vegetation management would occur, reduced harvest levels, increased need to maintain hardwoods as a component in forest stands, and reduced road access would limit the quantity of hardwoods available for firewood or other products. Availability of hardwoods for personal or commercial use is dependent on the amount of land available for timber management, and depending on the alternative, timber suited lands comprise between 10 and 26 percent of the Forest land base.

**Cumulative Effects:** The quantity of hardwoods on the Forest will change as the mix of seral stages changes over time and varying levels of management are applied. The quantity of hardwoods on unsuitable lands may increase in the Douglas-fir/tanoak/madrone type as conifers succumb over time and areas impacted by fire, insects, disease, or other disturbance are either not reforested or are reforested with fewer conifer trees.

Reduced availability of fuelwood may increase the level of illegal cutting and theft. Reduced harvest levels may increase the value and utilization for sawlogs and chips of hardwood and cull conifers, making them unavailable to firewood cutters. No additional cumulative effects specific to an alternative were identified.

**Mitigations:** Hardwoods are a component of the legacy or green tree retention standards for all alternatives. No mitigations specific to hardwood utilization were identified.

## Consequences and Mitigations Specific to An Alternative

## CUR Alternative

## Direct and Indirect Effects:

**Timber harvest level**: Timber management activities would be conducted on about 255,880 acres, or about 26 percent of the Forest land base. Of this area, about 75,620 acres (7 percent of the Forest) would be intensively managed for timber production. The remaining 19 percent (180,280 acres) would be managed for reduced yields for other resource emphases. The average annual harvest level would be 67 MMBF. About 25,560 acres would be harvested in the first decade. Approximately 95 percent of these acres would be regenerated and about 80 percent would be harvested by conventional logging systems.

**Hardwoods**: Hardwoods would be retained during intermediate and regeneration harvesting. Where hardwoods comprise a portion of the stand, at least 3 mature hardwood trees an acre would be left standing after intermediate harvests. Occasional hardwood trees would also be left standing in regeneration harvests where they do not pose an operational conflict. Hardwoods would be retained and managed as part of the tree component in younger plantations. The numbers of hardwoods in these plantations would vary depending on the vegetation type and stand objective.

This alternative could provide the second highest quantity of hardwoods for personal and commercial use.

## PRF Alternative

## Direct and Indirect Effects:

**Timber harvest level**: Timber management would be conducted on about 87,700 acres or 9 percent of the Forest land base. The focus of timber management activities would be on meeting resource objectives other than maximization of volume production. The intent is to create future stand conditions that would maintain functional forest ecosystems and habitat for organisms that require late seral conditions. This would result in reduced yields on all timber suited lands. The average annual harvest level would be 15.5 MMBF. Approximately 9,320 acres would be harvested in the first decade. About 39 percent of these acres would be regeneration harvested, and about 70 percent of the acres would be harvested by conventional logging systems.

**Hardwoods:** Stands would be managed to maintain a greater hardwood component than in the CUR alternative. Hardwoods would be retained during intermediate and regeneration harvesting. When stands containing hardwoods are regenerated, a portion of the hardwoods would be retained as dispersed individual trees and as part of the areas which are left uncut. Reforestation and timber stand improvement strategies would provide for establishment and maintenance of hardwoods as well as conifers. Hardwoods would be retained during precommercial treatments and commercial thinnings, and would be managed as a stand component throughout the rotation. Retention of hardwoods would result in a corresponding reduction in softwood volume production.

This alternative would provide the fourth highest quantity of available hardwoods.

## OGR Alternative

## Direct and Indirect Effects:

**Timber harvest level**: Timber management activities would be conducted on about 122,010 acres, or 13 percent of the Forest land base. As in the PRF alternative, the focus of timber management activities would be on meeting resource objectives other than maximization of volume production. This would result in reduced yields on all timber suited lands. The average annual harvest level would be 26.5 MMBF. Approximately 9,600 acres would be harvested in the first decade. About 81 percent of these acres would be regeneration harvested, and about 70 percent of the acres would be harvested by conventional logging systems.

**Hardwoods:** Management of hardwoods within harvest units would be the same as in the PRF alternative. This alternative could provide the third highest quantity of available fuelwood.

## MKT Alternative

### Direct and Indirect Effects:

**Timber harvest level**: Timber management activities would be conducted on about 264,060 acres, or 28 percent of the Forest land base. Of this area, about 89,010 acres (9 percent of the Forest) would be intensively managed for timber production. The remaining 19 percent would be managed for reduced yields for other resource emphases. The average annual harvest level would be 95.5 MMBF. A total of 23,660 acres would be harvested in the first decade. Approximately 88 percent of these acres would be regeneration harvested, and about 85 percent of the acres would be harvested by conventional logging systems.

**Hardwoods:** No special provisions would be made to retain hardwoods within intermediate or regeneration cuts on timber suited lands or to promote the development of a hardwood component within young stands. This alternative could provide the highest quantity of accessible hardwood for personal and commercial use.

## ECR Alternative

### Direct and Indirect Effects:

**Timber harvest level**: Timber management activities would be conducted on about 263,870 acres, or 28 percent of the Forest land base. For the first five decades timber yields would be greatly reduced as harvesting would be limited to thinnings and regeneration harvesting of highly fragmented mature forest patches. After the adjustment period of approximately five decades, regeneration harvesting could be applied to younger, larger sized stands in order to reach the desired seral stage distribution shown on page II-53. The average annual harvest level would be 11.6 MMBF. Approximately 12,940 acres would be harvested in the first decade. About 86 percent of these acres would be regenerated, and about 60 percent of the acres would be harvested by conventional logging systems.

**Hardwoods:** Management of hardwoods within harvest units would be the same as for the PRF alternative. This alternative could provide the least quantity of accessible hardwood.

## PESTS

### Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 34 Has the Forest developed a plan to control Phytophthora lateralis and to maintain Port-Orford-cedar.

Port-Orford-cedar grows in the lower one-third slope position along streams and in wet areas in a wide variety of plant associations. Port-Orford-cedar is present in the Smith River NRA and on the Orleans Ranger District as well as in a small portion of the Lower Trinity Ranger District. To date, the Port-Orford-cedar root disease fungus (*Phytophthora lateralis*) is present in parts of the Smith River drainage; the Klamath and Trinity River drainages remain uninfected.

### Assumptions Common to All Alternatives:

It is suspected that the primary means of spread of the root disease is related to road construction, road travel, and the use of soil disturbing equipment. The major differences among alternatives are related to miles of road, management direction for riparian reserves, levels of timber harvest, and levels of recreation or other activities involving road travel.

Uninfected portions of the Smith River drainage are most at risk, as there are no direct roads linking the Smith River drainage to the Klamath and Trinity River drainages.

Forest staff are familiar with the disease and causes of spread; management practices have been and will continue to be implemented to reduce the rate of spread of the disease.

Public users of the Forest who are unfamiliar with the disease and the methods by which it is spread have an increased potential for spreading the disease.

The following criteria were developed to assess the risk of introducing the disease into uninfested areas of the North Fork Smith River Botanical Area:

1. Exposure to infested soil: the likelihood of vehicles picking up infested soil and bringing it into the area.

2. Capability to transport infested soil: types of vehicles, number of vehicles, volume of infested soil that could be moved.

3. Exposure to Port-Orford-cedar: density and proximity.

4. Condition suitable for infestation - moisture, season, temperature, location, and road condition.

## Consequences Common to All Alternatives

**Direct Effects:**

Road travel has the highest potential for increasing the rate of spread of the root disease. The risk of introducing the root disease into uninfected drainages would be higher for alternatives that have more miles of open road in drainages containing Port-Orford-cedar as well as the types of use of those roads.

Timber harvest activities can spread the root disease through contaminated logging equipment or if logging trucks travel from infected areas to uninfected areas. Alternatives with higher levels of timber harvest pose more risk of spreading the disease.

As Port-Orford-cedar grows primarily along streams and wet areas, the size of riparian reserves and the activities allowed in riparian reserves are related to the risk of infection. Alternatives which allow timber harvest in portions of riparian reserves, or which have narrow riparian reserves, have a higher risk of spreading the disease.

Recreation use has the potential for spreading the root disease if recreationists travel from infected to uninfected areas. Alternatives with higher levels of recreation use would have a higher risk of spreading the root disease, particularly in the Smith River drainage. Dispersed use has a higher risk than developed use.

**Indirect Effects:**

Any activity that involves the use of Forest roads in drainages containing Port-Orford-cedar has the potential to spread the disease to uninfected drainages. Activities in addition to those mentioned above include firewood cutting, fire suppression, and special forest product collection.

**Cumulative Effects:**

The introduction of *Phytophthora lateralis* into uninfected drainages would result in further loss of Port-Orford-cedar, resulting in a loss of diversity in the plant associations where it is present.

## Mitigations Common to All Alternatives

The Forest will work cooperatively with other Forests, agencies and publics to implement the action items listed in the Region 5/Region 6 Port-Orford-cedar Root Disease Action Plan.

All alternatives will perform a risk analysis on projects in drainages containing Port-Orford-cedar or that pose a risk to Port-Orford-cedar.

All alternatives will utilize the appropriate disease control strategies listed in Appendix K of the Forest Plan to reduce the risk of spread through project-related activities. These strategies were developed by the Interregional Port-Orford-cedar Coordinating Group based on experience and research. Monitoring and research are showing that the disease control strategies are effective in reducing the rate of spread of Phytophthora lateralis by reducing the spread of soil containing spores.

All alternatives will provide the public with information concerning Port-Orford-cedar root disease, how it is spread, and methods of prevention.

## Consequences Specific to an Alternative

The alternatives are described in terms of their relative risk of spreading the root disease. All alternatives are assessed based on the use of the mitigation measures described above. These measures reduce the risk of spread of the root disease.

## CUR and MKT Alternatives

These alternatives propose the highest levels of road construction and timber harvesting. In addition, riparian reserves would be narrower than in the PRF and OGR alternatives, and areas of riparian reserve outside the inner gorge would be available for timber harvest. These alternatives pose the highest potential for spreading the root disease.

The CUR alternative would have a medium to high risk of spreading the disease into uninfested areas within the North Fork Smith River Botanical Area.

The MKT alternative would have a medium to low risk of spreading the disease into uninfested areas within the North Fork Smith River Botanical Area.

### PRF and OGR Alternatives

These alternatives have relatively low levels of timber harvest, and both would decrease the number of road miles on the Forest. Roadless areas in the Smith River and other key watersheds would remain roadless in the PRF alternative, greatly reducing the risk of spread into these areas. Riparian reserves would be the widest in the PRF and OGR alternatives, and would be reserved from timber harvest. In addition, standards and guidelines for road management within riparian reserves would provide more protection than in other alternatives. Recreation use is expected to be slightly higher in these alternatives compared to the CUR, MKT, and ECR alternatives, and the potential for spread as a result of recreation-related activities would be slightly higher as a result. Watershed analysis in the PRF alternative could provide a more integrated approach to implementing strategies for reducing the risk of spread of the root disease.

The PRF alternative would have a low risk of spreading the disease into uninfested areas within the North Fork Smith River Botanical Area.

The OGR alternative would have a very low risk of spreading the disease into uninfested areas within the North Fork Smith River Botanical Area.

### ECR Alternative

The number of road miles in the ECR alternative would be slightly lower than in the CUR and MKT alternatives. The size and management within riparian reserves would be the same as in the CUR and MKT alternatives. The level of timber harvest would be similar to that for the PRF and OGR alternatives, much lower than in the CUR and MKT alternatives. Recreation use levels would be the same as in the CUR and MKT alternatives. Overall, the potential for spread of the root disease would be lower than in the CUR and MKT alternatives, and higher than in the PRF and OGR alternatives.

The ECR alternative would have a low to medium risk of spreading the disease into uninfested areas within the North Fork Smith River Botanical Area.

## VISUAL RESOURCE MANAGEMENT

### Introduction

This section discusses the effects of alternatives in relation to the following issue:

Issue 38 How much of the forest scenery will appear undisturbed?

Impacts to the visual resource would vary through the range of alternatives. Site disturbing activities associated with general forest, partial retention, and managed habitat areas would have the most effect on scenery. Management activities that affect scenery under any of the alternatives are primarily those associated with timber harvest, related road construction, and other major facility construction. Habitat enhancement projects to improve foraging conditions would occur throughout the wildlife areas and would affect scenic quality.

Management activities that meet the inventoried visual quality objectives (IVQOs) would be within the acceptable limits of alteration of the natural appearing landscape. Management activities that are evident to forest visitors could affect the quality of recreation experiences.

The issue concerned what level of scenic quality should be provided. The alternatives respond to the issue by providing degrees of change from the existing visual condition (EVC) and the IVQOs according to the alternative emphasis.

### Consequences Common to All Alternatives

### Direct and Indirect Effects:

Most of the Forest would appear in an undisturbed or near undisturbed condition under all alternatives. The direct environmental effects by alternatives on the visual resource include degrees of change in the appearance of the landscape in most areas outside of designated Wilderness, Wild River corridors, Native American Contemporary Use Areas, and Research Natural Areas. These changes would be caused by management activities meeting different visual quality objectives (VQOs).

Impacts to visual quality, by management area, would be as follows for all alternatives. Management areas

are discussed in the same order they are presented in Chapter 2.

**Wilderness**: The size of these areas is the same in all alternatives. These areas would be managed to preserve their natural condition and allow ecological changes only.

**Wild, Scenic, and Recreational Rivers**: Wild rivers would be managed to allow ecological changes only; the natural condition would be preserved. Scenic rivers would be managed to retain a natural appearance, and recreation rivers would be managed to retain a near undisturbed or undisturbed appearance.

**Research Natural Areas**: The size of these areas is the same in all alternatives. These areas would be managed to preserve their natural condition and allow ecological changes only.

**Native American Contemporary Use Areas**: The size of these areas remains the same in all alternatives. These areas would be managed to preserve their natural condition and allow ecological changes only.

**Smith River Natural Recreation Area**: The Smith River NRA would be managed to maintain scenic values contributing to public enjoyment. Where management activities such as road building and timber harvest are permitted within the NRA, they would be designed to meet the undisturbed or near undisturbed appearance of the area. Visual management of the NRA remains the same for all alternatives.

**Special Habitat Areas**: The size of these areas varies by alternative. These areas would be managed to retain their undisturbed appearance with allowances for silvicultural strategies that are assigned by a species specific habitat improvement project. These strategies may result in dominant impacts on the natural appearance lasting several decades.

**Riparian Reserve Areas**: These areas would be managed to retain an undisturbed or near undisturbed appearance in all alternatives.

**Special Interest Areas**: The acreage of these areas would remain the same in all alternatives. Although different silvicultural strategies would be used in two of the alternatives (MKT and ECR), the areas would be managed to retain an undisturbed appearance in all alternatives.

**Managed Habitat Areas**: The size of these areas varies by alternative. These areas would be managed to retain a near undisturbed appearance. Differing management strategies are applied depending upon the alternative; these strategies may result in dominant impacts on the natural appearance lasting several decades.

**General Forest Management Area**: Timber management, road construction, and other resource management activities would generally be visible from low sensitivity travel routes or as middleground or background from moderate sensitivity travel routes or use areas. The color contrast between exposed soil and vegetation would be most apparent in areas where even-aged silvicultural systems are used. Smaller openings and selective harvest practices would reduce the visual effect. Site preparation activities and roads would also introduce unnatural linear patterns on the landscape. The size, intensity of management, and type of silvicultural strategy vary by alternative, and the consequences are discussed further by alternative.

## Cumulative Effects:

The duration of visual impacts varies according to the management activity. Road construction generally results in long term visual impacts exceeding 40 years. Timber harvesting activities vary in duration of impacts depending upon the specific silvicultural strategy and site conditions. There is generally a reduction of impacts over time that varies from 20 to 40 years as an area returns to a near undisturbed or undisturbed appearing condition.

The visual condition overall would improve from the present condition to the fifth decade and then level off. Forestation and growth would move the presently altered areas into conditions of near undisturbed and undisturbed appearance. This growth, combined with the reduction in the number of acres harvested, would result in a long term increase in visual quality. The visual condition of the Forest at the fifth decade would generally appear undisturbed or near undisturbed.

The cumulative effects of management activities on National Forest System land would meet the adopted VQOs. In some areas the visual condition may not meet the adopted VQOs due to the cumulative effects of timber harvesting on private lands. Various features, such as quarries, powerlines, and roadways, would not meet the adopted VQOs when seen from some viewing points.

The cumulative effects would not vary significantly by alternative.

## Mitigations Common to All Alternatives

Mitigation measures vary due to the nature of the management activity. Mitigation techniques with timber harvests involve varying silvicultural strategies to leave sufficient tree cover to reduce visual contrast: utilizing vegetative screening, locating units to reduce visibility, shaping units to emulate natural conditions, utilizing leave trees and leave clumps or islands of trees. Reducing stump height and/or covering stumps, removing unnatural quantities of slash, and locating slash/cull outside the immediate view zone are additional techniques to reduce visual impacts from timber harvest. Locating roads, including skid trails, to minimize visibility and reduce cut and fill slopes is critical to mitigate visual impacts.

No additional mitigations were identified for specific alternatives.

## Consequences Specific to an Alternative

The distribution of adopted visual quality objectives (VQOs) varies considerably by alternative. This distribution is shown in Figure IV-19. The various levels of VQOs represent different allowable levels of landscape alteration. The differences in adopted VQOs among alternatives relates primarily to the acres of partial retention and managed habitat areas and the type of silvicultural strategy applied to the general forest management area.

The existing visual condition is a benchmark from which an estimate can be made of the effects and rate of change to the landscape. The future visual condition of the alternatives is an estimate of the visual condition of the Forest at decade 5. The future visual condition estimation is based on harvest levels in acres, on the silvicultural strategy type reflected by regulation classes, and on projected wildlife improvement project areas. Table IV-34 shows the visual condition for each visual quality objective, by variety class, and the Visual Quality Index (VQI) for the five alternatives at the end of the fifth decade. The Visual Quality Index is a measure used to compare the impacts of the alternatives on visual resources in relation to the existing visual condition. The indices are developed by using a weighted value assigned to each visual condition/variety class. The weight is multiplied by every 100,000 acres of land in each visual condition/variety class category, and all categories are added together to obtain the VQI for the alternative. It is estimated that the overall trend of visual quality for the Forest would improve from the existing visual condition in all alternatives because of reduced harvest volumes and reduced even-aged silvicultural practices. Refer to Figure IV-20.

## CUR Alternative

The Visual Quality Index (VQI) rates this alternative as the second lowest, slightly above the MKT Alternative.

## Direct and Indirect Effects:

Approximately 87 percent of the Forest would have a preservation, retention, or partial retention VQO. This alternative would have a slightly greater amount in preservation and lesser amount of retention than the MKT alternative because of larger wild river corridors. It would also have more acres in partial retention than the MKT alternative. The areas seen from primary and secondary travel routes, rivers and other water bodies, and recreation use areas would retain an undisturbed or near undisturbed appearance.

## PRF Alternative

The VQI rates this alternative as the highest.

## Direct and Indirect Effects:

Nearly 100 percent of the Forest would have a preservation, retention, or partial retention VQO. This alternative would have the highest amount of retention VQO due to the number of acres in the special habitat management area. It would also have the highest amount of combined partial retention and retention areas (same as the OGR and ECR alternatives); this would be due primarily to modified silvicultural strategies that mimic natural disturbance regimes and emphasize multi-storied stand management. This alternative has the least amount of acres under timber management, which contributes to a high visual quality index.

## OGR Alternative

The VQI rates this alternative as the second highest, just below the PRF Alternative.

### Direct and Indirect Effects:

Nearly 100 percent of the Forest would be in a preservation, retention, or partial retention VQO. This alternative would have the highest amount of combined partial retention and retention VQOs — the same as in the PRF and ECR alternatives. This alternative would have the second largest amount of retention VQO due to the number of acres in the special habitat management area. This alternative, like the PRF alternative, also utilizes a modified silvicultural strategy that emphasizes multi-storied stand management.

## MKT Alternative

The VQI rates this alternative as the lowest.

### Direct and Indirect Effects:

This alternative is similar to the CUR Alternative with 86 percent of the Forest in a preservation, retention, or partial retention VQO. The areas seen from primary and secondary travel routes, rivers and other water bodies, and recreation use areas would retain an undisturbed or near undisturbed appearance. Areas of the Forest such as the Special Habitat and Managed Habitat Management Areas would retain an undisturbed or near undisturbed appearance. The General Forest Management Area would be managed with the more traditional even-aged silvicultural strategies; however, the visual impacts would be softened by mitigation measures common to all alternatives. Other management areas would also, as indicated previously, retain an undisturbed or near undisturbed appearance.

## ECR Alternative

The VQI rates this alternative in the middle of the alternatives.

### Direct and Indirect Effects:

This alternative, along with the PRF and OGR alternatives, would have the greatest amount of retention and partial retention VQO (85 percent) and, correspondingly, the least amount of modification. Most of the Forest would appear undisturbed or near undisturbed. This alternative would have the greatest amount of General Forest Management Area which is assigned a partial retention VQO. The silvicultural strategy applied (6) would allow large areas of a modified treatment that emphasizes multi-storied stand management to emulate natural changes in the ecosystem. The actual acreage, Forest-wide, that would be altered at any given time would be the lowest of all the alternatives due to the long rotations. The General Forest Management Area would retain a near undisturbed appearance for the most part.

# ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

## PHYSICAL ENVIRONMENT

### Soils, Water, and Riparian Zones

Although Forest-wide standards and guidelines, best management practices (BMPs), and the Monitoring and Evaluation Plan have been designed to prevent adverse effects to soil and water, the potential for their occurrence does exist. Sediment production will exceed natural rates as long as roads are built, timber is harvested, and other activities which disturb vegetation and soil occur. Sediment will be produced by surface erosion, channel erosion, and landslides.

State and federal water quality standards for turbidity may not be met temporarily in some specific locations because of the difficulty in preventing all soil erosion from newly disturbed sites. However, BMPs, standards and guidelines, and monitoring will prevent or mitigate any appreciable adverse soil and water impacts to established beneficial uses. In addition, the Six Rivers National Forest will coordinate with the Forest Service Regional Office, the North Coast Water Quality Control Board, and the Environmental Protection Agency in regard to BMP implementation. Current practices will be updated when new information or improved methods are developed which are both technically correct and practical in application.

Sediment and turbidity originating from areas managed for timber production have the greatest potential to adversely impact fish habitat. Stream water temperatures could increase in certain stream reaches if riparian vegetation is inadvertently removed (such as blowdown), but should remain unchanged or be reduced under normal conditions over time.

Drinking water may be contaminated by human use, especially when such use is concentrated along streams. Domestic water supply, if diverted directly from Forest streams, could be adversely affected during or shortly after road construction or other activities, and for short periods during more intense winter storms. However, the degree of impact will be both short in duration and limited due to site specific planning requirements and mitigations provided through the standards and guidelines.

Existing or potential conditions that could adversely impact the soil or water resource will be treated through watershed restoration or rehabilitation improvement projects.

Soil displacement or erosion can be expected to result from planned management activities such as vegetation removal, slash disposal, log skidding, prescribed fire, construction and maintenance of roads, trails, transmission facilities, and recreation sites. Soil productivity will be maintained, except for sites dedicated to roads, skid trails, recreation sites, and other facilities or uses that may compact the soil, alter soil profiles, or deplete nutrients. It is estimated that less than one percent of the Forest will be occupied by permanent roads or facilities. Experience has shown that temporary road surfaces can be revegetated, but that soil productivity is reduced. Forest-wide, it is estimated that up to a maximum of 15 percent of tractor-logged areas will experience an increase in soil bulk densities or compaction.

### Air

Impacts to air quality cannot be avoided in the range of alternatives; however, all of the impacts will be temporary. Wildfires will continue to occur, generally at times and under conditions that produce more particulate matter than a prescribed fire of equal size. In addition, these will take place under weather conditions which are typically less conducive to good smoke dispersal.

An expanding program of prescribed burning would create smoke that could impair visibility for Forest users or nearby residents despite efforts to direct smoke away from populated areas. This would be a short-term effect generally lasting less than one day each time it occurred. Short-term reductions of air quality will occur due to dust and engine emissions as a result of increased vehicle use.

## BIOLOGICAL ENVIRONMENT

### Biological Diversity

Forest vegetation may be altered in respect to species composition, stand structure, and successional stage. With the exception of reserved areas such as research natural areas, wilderness, and dedicated wildlife habitat areas, existing mature forest on suitable ground will be subject to timber management. Management

treatments include removal of overmature trees from multi-storied stands, group selection cuts, salvage and sanitation harvests, and thinnings. In some alternatives, intensively managed or regulated forests may provide less habitat for species dependent on old-growth, snags, and down woody material. Across a landscape, habitat and species diversity will generally be maintained with management.

### Riparian Zones

See discussion under Physical Environment: Soils, Water, and Riparian Zones.

### Wildlife

Wildlife species will be temporarily or permanently displaced when suitable habitat is degraded or removed by timber harvest, facility development, road construction, livestock grazing, or recreational use. Some alternatives will reduce the acreage of mature and old-growth forests; the species populations that depend on these types will be displaced and may be reduced. Activities which occur in the vicinity of breeding habitat during breeding seasons may displace some wildlife species or reduce reproductive success. Management activities may also cause a decline in habitat quality by eliminating or reducing habitat components such as snags, hardwoods, and down woody material. The removal of suitable habitat can lead to fragmentation, thereby reducing the size and configuration of interior forest conditions and increasing predation along the forested edge.

### Fisheries

See discussion under Physical Environment: Soils, Water, and Riparian Zones.

## SOCIAL AND ECONOMIC ENVIRONMENT

### Social

Adverse impacts to the Commodity Dependent social group's lifestyle, beliefs, values, and behaviors are unavoidable due to social and economic changes and conditions at the national level. The available timber land base from the 1989 base year level of 473,390 acres (Six Rivers National Forest 1987 Draft Environmental Impact Statement-withdrawn 1990) to the current level of 255,870 acres represents a reduction of 54 percent. This is due to the creation of the Smith River National Recreation Area, listing of the northern spotted owl and subsequent creation of Habitat Conservation Areas (HCAs) and Late-Successional Reserves, interim policy and direction for the protection of furbearers, listing of the marbled murrelet, and the FSEIS ROD.

Adverse impacts to community stability and cohesion are unavoidable due to the continued decline in the number of primary sector (timber) jobs and the increase in lower paying service sector jobs. County services (especially social services) will continue to decline due to losses from the 25 percent return to county receipts generated by the sale of Forest Service timber. Cohesion will continue to decline due to increased polarity and animosity between the Commodity Dependent and Environmental Priority groups.

### Economic

Levels of commodity resources provided by the Forest will decrease noticeably in response to changing conditions and legal requirements. Decreases in timber harvest levels have direct effects on local communities, governments, and businesses in terms of socioeconomic variables such as occupational lifestyles, leisure, attitudes, beliefs, values, and community institutions. Forest users will encounter more controls and restrictions as management intensity, resource competition, and population levels continue to increase over time.

## RESOURCE MANAGEMENT PROGRAMS

### Heritage Resource Management

The Forest-wide standards and guidelines and Forest monitoring are designed to ensure that known heritage resources, and those discovered during land management activities, are protected and mitigated from adverse effects. Current inventory methods are designed to locate all significant heritage resources. However, due to variable field conditions, the preservation qualities of heritage resources, and other factors, all sites may not be located during inventories. If they are not discovered and protected during project activities, some sites may be inadvertently damaged or destroyed. Heritage sites located in wilderness and other areas where project activity is limited would also

limit heritage resource inventories. As a result, some heritage sites may be lost or damaged from natural agents or dispersed recreation use. Such impacts are unavoidable pending advances in inventory methods and completion of surveys beyond limited project areas.

Increased public access and dispersed recreation in some alternatives could ultimately lead to disturbance of heritage resources. Timber management and road construction unavoidably increase the potential for inadvertent damage to heritage properties, regardless of precautions. Unavoidable disturbance from wildfires, landslides, and floods will continue.

### Fire and Fuels Management

Impacts to the array of Forest resources from wildfire cannot be totally avoided. Their occurrence will be random in both time and space, but areas with the highest probability for an ignition can be identified. The severity of the impact will depend on the intensity of the fire, which will be determined by site-specific parameters such as fuel loading, weather conditions, and topography.

Short-term soil erosion and loss of vegetation will occur during the construction of firelines, despite preventive measures. The build-up of fuels will continue in areas protected by a fire exclusion policy. Soil erosion and the use of aerially delivered fire retardants may result in short-term water quality degradation. Recreational opportunities may be interrupted or limited in fire areas for short periods of time. The aftermath of small fires will remain visible for a short time. The location of a major fire will remain visible for decades.

Adverse impacts will also occur to some resources, such as soil and air quality, from the use of prescribed fire in the treatment of activity-related and natural fuels, and from wildlife habitat maintenance. The severity of these impacts will depend on the intensity and duration of the prescribed fire. Normally, the treatment will be designed so that the activity is implemented to achieve an acceptable level of impact to target and non-target resource values.

### Range Management

Forest-wide standards and guidelines to improve riparian conditions may initially result in increased costs in range management, such as in installation of improvements (fencing and water developments), herding and transport to control stock distribution and use, and possible reductions in stocking levels.

### Timber Management

A reduction in growth and yield will occur on lands managed for other resource objectives than full timber production. The resultant decline in the Allowable Sale Quantity will have direct social and economic effects in terms of lower employment levels in the timber industry and reduced revenues to county road and school programs.

### Visual Resource Management

Standards and guidelines for visual resource management specify visual quality objectives (VQOs) for each management area. The VQOs of retention and partial retention provide for alterations which do not dominate the character of the natural landscape. The VQO of modification provides for alterations which dominate the natural landscape character, but borrow elements of line, form, color, and texture from the natural setting to the extent and scale that the alteration blends in with it. In the foreground, and in some cases the middleground distance, viewers may find the alteration to be excessive in terms of their own expectations.

Short-term decreases in the visual quality of foreground and middleground areas seen from travel corridors will result from periodic regeneration timber harvest and road construction. Prescribed burns create some textural and color changes in conifer landscapes, but the visual condition should decrease only slightly. Firelines around large wildfires would create a strong, unnatural contrast to the landscape and, in some cases, a serious impairment of visual quality to the viewer.

## RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity is complex. Forest management of public lands is purposefully a long-term venture, but one that must serve the year-to-year needs of society.

Some practices and activities proposed in the alternatives may produce benefits at the expense of long-term productivity of the land. These uses are short-term in the sense that they may occur for a relatively short duration, while their effects may last beyond the planning horizon, or possibly in perpetuity. These are presented below in the order used in previous sections of this EIS.

## PHYSICAL ENVIRONMENT

### Soils

Long-term productivity refers to the continued ability of the land to provide resource outputs. This inherent ability is lost if soil productivity and hydrologic characteristics are impaired, or if the physical character of the landscape is altered beyond short-term recoverability. Long-term productivity depends on conservation of the soil and health of its living system.

Some Forest uses may produce both short-term and long-term negative consequences. For example, soil exposure to harsh environmental conditions such as desiccation, nutrient removal, severe fire, compaction, or erosion can result in a gradual decrease in timber supply for future generations. Soil production is paramount both to a sufficiency of annual harvest and to a sustained yield.

The Forest-wide Standards and Guidelines for soil and water have the potential to maintain soil productivity. Through project implementation, monitoring, and improvement of practices, long-term productivity of the Forest can be maintained.

## BIOLOGICAL ENVIRONMENT

### Biological Diversity

In the long term, diversity is directly related to forest health and productivity. Generally, those alternatives that have larger land areas allocated to non-consumptive uses are maintained by natural processes. In intensively managed areas, the health and productivity of the Forest is a concern. Therefore, the risk of diversity loss and long-term productivity is least under the PRF, OGR, and ECR alternatives, which have less consumptive uses.

### Wildlife

Wildlife species occurring within the Forest will be maintained over the long term and contribute to population viability throughout each species' range. However, fluctuations in populations will occur, and some suitable habitat may remain unoccupied. Those alternatives (CUR and MKT) with higher timber levels will support higher populations of wildlife species that use harvested areas. The PRF, OGR, and ECR alternatives should support relatively higher populations of old-growth-dependent wildlife species due to longer rotations and silvicultural strategies developed to achieve functional, suitable mature and old-growth habitat conditions. A decline in some deer herds is expected under all alternatives.

## RESOURCE MANAGEMENT PROGRAMS

### Timber Management

The most significant activity proposed in the alternatives is the management of vegetation for timber production, wildlife habitat, recreation, and livestock grazing. Well-planned and carefully implemented short-term projects can and do produce effects that will increase long-term productivity. For example, harvesting unmanaged, understocked, stagnated stands of trees will lead to the creation of plantations of young trees, trees that will produce greater volumes as they are managed throughout their rotation.

Lands identified as unsuitable for sustained yield timber management have been allocated for other resources such as soil, watershed, or wildlife habitat protection. Distribution of timber harvest activity, retention of old-growth, and protection of riparian areas have been designed to prevent long-term impairment of the land and maintain resource productivity.

Construction of temporary project roads and landings, mechanical slash piling, and log skidding compact the soil. These activities reduce long-term timber productivity on a site unless proper mitigation measures are taken.

# IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are decisions causing changes that cannot be reversed; once used, the resources cannot be reinstated nor can opportunities be renewed. Irreversible commitments apply to activities or events such as mining, road construction, cultural resource disturbance, and dam construction that affect nonrenewable or depletable resources.

Irretrievable commitments are opportunities for production or use of resources that are foregone for a period of time because of land use decisions, allocations, or constraints. Examples are loss of timber production, livestock grazing, or developed recreation outputs to provide for such benefits as enhanced wildlife habitat or visual quality. The decisions are reversible, but the production opportunities foregone while the constraints are in effect are irretrievable.

Irreversible and irretrievable commitments are presented below in the order used in previous sections of this FEIS.

## PHYSICAL ENVIRONMENT

### Soils and Water

There is an inherent risk of accelerating erosion, and other changes in the physical and biological properties of soils, when harvesting timber and building roads on the Forest. Surface and channel erosion, severe soil compaction and displacement, damage to proper functioning of soil biological processes, and so forth, could lead to either limited or total loss of site productivity. Productivity, once lost, requires a long time for natural processes to restore. The soil and water protection measures identified in the Forest-wide standards and guidelines, and incorporated into best management practices, are designed to minimize the potential for irreversible losses from proposed management practices.

### Air

There is no irreversible or irretrievable commitment of resources associated with the temporary impacts to air quality over the range of alternatives. Mitigating measures such as yarding unmerchantable material, chipping and burying will, however, require the irreversible commitment of fossil fuels.

## BIOLOGICAL ENVIRONMENT

### Biological Diversity

Old-growth forests, once harvested, are considered an irretrievable loss. To develop old-growth forest characteristics again will require approximately 160 to 220 years, depending on the silvicultural strategies used to regenerate and manage the stands. Insects, disease, and fire can also contribute to this loss. If left unmanaged, stand decadence may alter old-growth sufficiently to set the vegetative structure back to an early successional stage. The result would be a natural change, or loss, of old-growth, which would constitute an irretrievable loss to the Commodity Dependent social group.

### Wildlife

In areas such as the timber-suited land base, where wildlife levels are allowed to decrease from present levels, there will be an irretrievable commitment for some wildlife species. The irretrievable commitment would result from the loss of animals (decline in populations) and associated opportunities for observing, hunting, and nature study, as compared to what the area might have produced if the populations had not declined. Activities that remove habitat and forage, or disturb and displace animals as a result of an allocation of land or vegetation for another resource, generally cause these declines. As with timber production or livestock grazing, however, this loss is irreversible. The most important irretrievable commitment is the removal of old-growth forests and the resulting decline in habitat for wildlife species, such as the spotted owl, which depend on mature and late successional forest conditions.

## RESOURCE MANAGEMENT PROGRAMS

### Heritage Resource Management

Timber activities, facility construction, mining, visitor use, theft, and vandalism, along with many other land management activities, may destroy irreplaceable archeological and historical sites. These activities can damage identified and unidentified sites. In fact, heritage resource mitigation measures could also impact heritage resource values. A common

mitigation method used before a site is impacted by project activities is to undertake a data recovery or documentation program of the site. Once undertaken, the effects of data recovery are an irreversible commitment of the resource. These programs can only recover part, not all, of the significant values contained by the site. Much of the importance of heritage resources lies in their continued existence for future generations to study and enjoy as part of their cultural heritage. Once a site is removed or irreparably disturbed, these values are permanently lost.

## Energy Resources Management

The use of fossil fuels in the administration of the National Forest is an irreversible resource commitment. Alternatives vary only in the amount of consumption.

## Transportation and Facilities Management

The majority of the roads constructed on the Forest become permanent features on the landscape. Roads which are scheduled for reclamation do not return the land to its prior productive state. For all roads on the transportation system, there is a definite long-term loss of either some or all site productivity within the excavated road prism.

Construction of dams is one possible irreversible action that is beyond the scope of Forest planning, since the initiation lies outside Forest Service authority. In the event of proposals stemming from external sources, site specific environmental analyses would explore the extent and consequences of irreversible commitments. The role of the Forest Service would be to mitigate impacts on associated resources and seek to hold irreversible commitments to a minimum.

## Fire and Fuels Management

There is no irreversible commitment of resources associated with fire prevention, suppression, or fuels programs, as they could be curtailed at any time. There will be a minor irreversible commitment of fossil fuels involved with various fire management activities.

## Minerals Management

Development of the mineral resources in all alternatives would lead to an irreversible commitment of those resources and, in many cases, to the land thereby affected.

## Range Management

Grazing allotments may be restricted to protect other resource values, such as riparian areas. This would constitute an irretrievable loss to the permittees.

## Recreation Program Management

The commitment of the Forest's unroaded areas to timber production constitutes an irrevetrievable loss of the primitive character required to maintain the physical settings necessary for primitive and semi-primitive non-motorized recreation experiences.

## Roadless and Wilderness Area Management

Wilderness potential (characteristics) in those roadless areas allocated to management where development may occur is irretrievably lost. This irretrievable loss, though, will occur only upon project implementation and not as a direct effect of the Forest Plan allocation.

## Wild and Scenic Rivers Management

Designation of the inventoried Wild and Scenic Rivers would permanently reduce or prohibit timber harvest. Mineral exploration and development is also restricted or prohibited. Construction of dams, diversions, and hydropower development will not be recommended.

## Timber Management

Some forested acres are allocated to other than a timber prescription in each alternative; an average production of 265 board feet per acre per year that could contribute to the allowable sale quantity would be irretrievably lost from them.

## Visual Resource Management

The commitment of Forest land to development of permanent facilities such as roads, rock pits, and structures constitutes an irreversible and irretrievable commitment of the natural appearance of the landscape in most cases, although efforts are made to mitigate these effects.

## POSSIBLE CONFLICTS WITH FEDERAL, REGIONAL, STATE, AND LOCAL LAND USE PLANS, INCLUDING INDIAN PLANS

There are no known possible conflicts with federal, regional, state, and local land use plans, including Indian plans. The Forest will coordinate with federal and state agencies, counties, local governments and Indian Tribes to continue to assess the relationship of the forest plan and other land use plans.

Other agencies with jurisdiction over resources on the Forest include an array of government agencies such as the County Governments of Del Norte, Siskiyou, Humboldt, and Trinity; the Tribal Governments for Hoopa Valley, Karuk, Yurok, and Covelo Tribes; CDFG; the Klamath River Task Force; State Water Resource boards; USFWS, NMFS, and U.S. Bureau of Reclamation. Local government agencies, state and Federal agencies and interest groups have begun to work together to resolve conflicts of management direction. Continuing dialogue among the groups involved has and will continue to result in coordinated management planning for the Forest and adjacent lands. Cooperation among the participant parties for future management should serve to minimize conflicts in management direction and program implementation.

## ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

With the emphasis on energy conservation, Forest management activities and energy programs have raised concerns that merit discussion. The objective of this evaluation is to provide additional considerations through which Forest planning alternatives can be assessed and compared. The following analysis provides a descriptive means to determine energy characteristics of Forest-based resources. Its purpose is to supplement economic and environmental considerations rather than to replace them.

Energy is consumed in the administration and use of the natural resources of the Forest. Major energy sources are gasoline, diesel fuel, liquefied petroleum, electricity, and wood.

Energy is yielded as hydroelectric power, fuelwood, red meat, and energy-use reduction. The following discussion describes the estimated consumption and yield of energy for all alternatives.

### Water

Energy consumed in obtaining water is small. Substantial energy is yielded by hydroelectric generating facilities.

### Biomass and Firewood

Energy can be consumed by: (1) logging residue removal, (2) chipping, (3) chip transportation, and (4) firewood cutting and transportation. Energy is yielded in home firewood use. Additional energy is also yielded from electrical generating plants.

### Facilities Management

The Forest consumed about 99,000 gallons of gasoline and 25 billion British Thermal Units (BTUs) in general administration for vehicles and buildings in 1990. In an attempt to reduce energy consumption, the Forest uses fuel efficient vehicles and retrofits existing buildings with additional insulation and more efficient heating systems.

1985 was established as a baseline year by the President to monitor reductions in energy consumption. Through the application of energy conservation measures and a retrofitting program, the Forest reduced energy consumption in buildings and facilities by at least 10 percent between 1985 and 1994, and has a goal to reduce energy consumption by 20 percent between 1995 and 2000. This is a projected savings of 5 billion BTUs by the year 2000.

### Fire Management

Fire management involves energy consumption in suppressing wildfires and treating fuels. Both types of fire consume wood energy. Fire management, or fire itself, yields no useful energy.

### Range Management

Energy is consumed in forage and structural improvement, cattle transport, and travel of permittees. Energy yield is from meat production.

### Recreation Program Management

Energy is consumed by (1) operation, maintenance, and construction of recreation sites, (2) transportation to recreation sites, and (3) recreation use (examples are water skiing and off-highway vehicle travel). Recreation yields no quantifiable energy.

### Timber Management

Energy is consumed by: (1) forest management, (2) logging, (3) road construction and maintenance, (4) log transport to mills, (5) log processing, (6) lumber transport to the consumer, and (7) building construction. Energy is yielded by utilizing residue as fuel and by savings from constructive use of energy-efficient materials.

## OTHER DISCLOSURES

### Effects of Alternatives on Threatened and Endangered Species and Critical Habitat

Regardless of the alternative, protection of listed species will take precedence over other land management direction. The bald eagle, peregrine falcon, McDonald's rock-cress, and Humboldt milk-vetch are the only endangered species known to inhabit the Forest, and the northern spotted owl and marbled murrelet are the only threatened species known to inhabit the Forest. As additional species are proposed for listing, the Forest will conference with the USFWS to ensure that our actions are not likely to contribute to their listing or adversely affect essential habitat.

While some of the alternatives would provide greater protection than others, none of the alternatives would have a significant adverse impact on presently listed threatened and endangered species. The Forest will comply with all appropriate Threatened and Endangered species recovery plans, regardless of the alternative. Provision is made in the Forest Plan to pursue informal or formal consultation as necessary during project design and environmental analysis.

### Effects on Prime Farmland, Rangeland, and Forest Land

All the proposed actions in the alternatives are consistent with the intent of the Secretary of Agriculture direction (FSH 1090.15) for protecting and managing prime lands.

### Effects of Alternatives on the Human Environment

The civil rights of any American citizen are not differentially affected by implementation of any alternative.

### Effects on Wetlands and Floodplains

No significant adverse effects within areas of wetlands and floodplains are anticipated. This is largely due to the very small size of upslope wetlands (tiny bogs and small ponds) and the limited amount of floodplain in stream and river areas. Where floodplains exists, they are allocated to the riparian management zone which restricts management activities and development. Other than existing developments, such as roads and campgrounds, management within riparian areas is extremely limited.

Protection is also afforded to these areas through BMPs incorporated in the Standards and Guidelines, in requirements of the riparian management area, in environmental analyses, and by Executive Orders 11988 (floodplains) and 11990 (wetlands). Collectively, these provide excellent direction to insure that management activities do not have unacceptable adverse impacts on wetlands and floodplains. Avoidance of these areas will also be a common practice.

## INCOMPLETE OR UNAVAILABLE INFORMATION

Forest management is not a definite science. Knowledge is continually evolving on how to maintain healthy and diverse communities of forest plants and animals while providing commodity uses on National Forest System lands. In many instances, it was not possible to fully assess resource impacts from management activities because important information was not available. The discussion in this chapter is based on the best information available to evaluate the environmental consequences.

## Biological Diversity

Biodiversity is a rapidly evolving field of study within the scientific community. This includes diversity of plant communities as well as genetic diversity within species. The Forest's management of diversity and threatened, endangered, and sensitive species is based on the best information currently available. Changes in management may follow as our base of knowledge expands.

Specific research needs for managing vegetative diversity include refining the specific characteristics required by old-growth-dependent plants and animals, particularly sensitive or unusual species. There is uncertainty in the best way to manage old-growth stands over time to insure that old-growth values are retained and losses due to wildfire, pests, or other catastrophic events are minimized. Other information needs include the best ways to manage younger stands to develop old-growth characteristics over time.

## Sensitive Plant Species

Much is unknown about the distribution and abundance of sensitive plants on the Forest. Specific needs include a comprehensive inventory of all Forest land and detailed studies of habitat requirements of plants found on the Forest. Reproductive and genetic studies of sensitive plant populations would also be useful for management. Some of this information will be gathered in the process of developing management guides for each sensitive plant species.

## Wildlife

Much is unknown about wildlife species abundance, distribution, and habitat needs on the Forest. This is particularly true for the management of sensitive wildlife species. There has not been enough research in the Klamath province to determine how management activities such as timber harvesting affect sensitive wildlife populations and habitat distribution. Regional direction, a regional draft literature review, and habitat capability models were used to establish habitat and/or viability population levels. Continued research is needed to verify these assumptions.

## Fisheries

Additional research is needed on the abundance, distribution, habitat conditions, and habitat requirements for anadromous and resident fisheries. Over the past decade, the anadromous fish population has declined dramatically. This decline is partially due to downstream water uses and fisheries practices outside of National Forest System lands. However, more information is needed on the relationship between anadromous smolt production and the number of adults which subsequently return and reach spawning grounds within the Six Rivers National Forest.

## Social

The level of acceptance of the changes among resource-dependent residents will largely determine their adaptability to the changes. Harold Kaufman, in his master's thesis, "Social Factors in the Reforestation of the Missouri Ozarks" documents the "importance of social relationships and human attitudes as key determinants for new forestry practices to arise within a community" (Lee, et al, 1990). He suggested that changes in forestry practices will be best promoted by an understanding of the human processes of adoption and dissemination of new knowledge among community residents.

To gain this understanding, it will be helpful to institute social data collection to gather information about the effects that implementation of the plan has on the community, once it becomes the established management direction. This information can then be used to establish localized baseline data to use for analysis and comparison, as well as to assist in making informed decisions about future land management decisions and their effects on the local community.

## Timber Management

Some of the proposed silvicultural methods have not been extensively used on the Six Rivers National Forest in past decades. Because some of the alternatives propose new and relatively untested silvicultural strategies, information is required about the effectiveness of these methods.

# LIST OF PREPARERS

## PLANNING TEAM

A planning team was established to support the interdisciplinary team during the preparation of the Final Environmental Impact Statement (FEIS) and Forest Plan. The primary role of the planning team was to do the necessary data collection and analysis and to prepare the FEIS and Plan as directed by the interdisciplinary team. The planning team members are identified below and their responsibilities, education, and experience summarized.

**LAURA M. CHAPMAN**
Forest Planner (1992-present). B.S.E., civil engineering, 1984. M.S., environmental systems, pending. Registered Professional Engineer (Civil), 1991. Additional classes in NEPA, planning, forest modeling, GIS, and social assessment. Relevant experience: four years as civil engineer, three years as hydrologist, two years as Forest Planning Analyst.

Team Leader. Responsible for all aspects of formulation and completion of the FEIS and Forest Plan. Provides technical expertise in NEPA, NFMA, and RPA laws, policy and implementation. Also provides technical expertise in data analysis, database management, and computer mapping.

**GEORGE J. ALBERT, JR.**
Visual Information Specialist (1984-present). A.A., geology, 1972. A.S., physical science, 1978. B.A. geography, 1991. Additional courses in NEPA, planning, GIS and Social Impact Analysis, member Pi Gamma Mu International Social Science Honor Society, 1993. Relevant experience: five years as a cartographic Technician with the U.S. Geological Survey ; six years as planning core team cartographic technician; two years as illustrator/team leader; two years as Forest GIS core steering team member and cartographic advisor.

Responsible for maps, graphics, social impact analysis discussions, wild, scenic and recreational river mapping, roadless area and ROS area updates, GIS data entry, tracking, and quality control. Provides technical expertise in geography, cartography, social impact analysis, and graphic design.

**JERRY BARNES**
Forest Fisheries Biologist (1972-present). B.S. geology, 1955. Three years graduate courses in fisheries. Relevant experience: One year with Oregon Department of Fish and Wildlife as Fisheries Biologist.

Responsible for fisheries and riparian discussions.

**MICHAEL J. FURNISS**
Forest Hydrologist/Soil Scientist (1991-present). B.S., Soils and Plant Nutrition, 1974. M.S., Soil Science, 1977. Relevant experience: 13 years as District hydrologist/soil scientist, specializing in restoration planning and techniques and in mitigation of road-related watershed effects.

Responsible for water and soil discussions.

**JEAN M. HAWTHORNE**
Public Services Staff Officer (1994-present), Past Land Management Planning/ Recreation/ Heritage Resources Staff Officer (1991-1994). B.A., outdoor recreation administration, 1974. Relevant experience: six years as Forest Public Affairs Specialist with interpretive services, recreation, and human resource programs; six years as Regional Interpretive Services Program Leader with responsibilities for tourism,

marketing, interpretive association management, visitor services, training, and HOST program.

Responsible for recreation discussions.

**LISA D. HOOVER**
Botanist (1990-present). B.A., environmental sciences, botany emphasis, 1981. M.S., forest ecology, 1988. Relevant experience: one year as botanist with National Park Service, two years as a botanical consultant; currently a member of two natural resources advisory boards; active involvement with the Nature Conservancy.

Responsible for botany, research natural area, special interest area, and special forest products discussions and standards and guidelines.

**THOMAS M. JIMERSON**
Zone Ecologist (1984-present). B.S., wildlife and fisheries management, 1974. M.S., natural resources with forestry emphasis, 1978. Ph.D., wildland resource science, 1990. Relevant experience: two years as a botanist with the U.S. Fish and Wildlife Service; six years as Forest Botanist managing Sensitive Plant Program.

Responsible for biological diversity, research natural areas, and special interest area discussions, assumptions for vegetative modeling.

**DAVID W. JONES**
Humboldt Nursery Manager (1994-present) and Forest Silviculturist (1989-present). B.S., forest management, 1968. Advanced courses in Forest ecology and silviculture, 1980. Region 5 certified silviculturist, 1983. Relevant experience: three years as Reforestation Forester; one year as District Resource Officer; nine years as District Silviculturist.

Responsible for silvicultural strategies, management area direction, trees with special management consideration.

**MARK A. LANE**
Range Conservationist (1991 to Present). A.A., forestry, 1975. B.S., range/forest management, 1983. M.S. range science, 1988. Relevant experience: six years as Range Conservationist with the Soil Conservation Service; two years as Biological Technician with RMFRES, AZ.

Responsible for range data and discussions.

**SUSAN G. MACMEEKEN**
District Silviculturist (1990-present). B.S., forestry, 1981. Region 5 Certified Silviculturist, 1983. Relevant experience: five years as District Timber Planner; five years as District Culturist.

Responsible for timber, vegetation, pests, and trees with special management considerations sections.

**JEFFREY L. MATTISON**
Wildlife Planning Biologist (1991-present). B.S., wildlife management, 1974. M.S., range ecology/ hydrology, 1977. Additional courses in NEPA documentation and Endangered Species Act. Relevant experience: eight years as District Wildlife Biologist; four years as Assistant Wildlife Planning Biologist.

Responsible for wildlife input, including biodiversity and threatened and endangered wildlife species, timber and wildlife interactions.

**MICHAEL E. McCAIN**
Fishery Biologist (1991-present). B.S., fisheries, 1987. M.S., natural resources, 1994. Additional courses in freshwater and landscape ecology, biometrics, and mathematical modeling. Relevant experience: one year as soil and water conservation Technician with State of Ohio; one year as Biological Technician with State of California Department of Fish and Game; two years as Biological Technician with the U.S. Fish and Wildlife Service; five years as Research Biological Technician with Redwood Sciences Lab, Pacific Southwest Forest and Range Experiment Station, USFS.

Responsible for fish and wildlife data, Forest monitoring program and editing.

**RAYMOND L. McCRAY**
Forester-Recreation (1992-present). B.S., forestry, 1983. Additional training in recreation management, NEPA, technical writing, and engineering. Relevant expreience: ten years as District Forestry Technician; five years as logging system specialist and team leader; three years as District Recreation and Heritage Resource Program Coordinator.

Responsible for wilderness and roadless management data and discussions, wild and scenic river data, OHV data.

**DONALD A. PASS**
Forester (1988-present). B.S., forestry, 1978. Additional courses in NEPA, timber planning and

wilderness management. Relevant experience: seven years as District Timber Sale Preparation Technician; one year as District Timber Sale Preparation Forester and silviculturist; three years as District Timber Planner; two years as District Wilderness Manager.

Responsible for wilderness and roadless management data and discussions, wild and scenic river data.

**SHIRLEY M. RECH**
Forester (1989-present). B.S., forest management, 1986. M.S., forest management, 1989; MBA, 1989. Additional courses in NEPA, forest economics, and public administration. Relevant experience: four years as District IDT member responsible for social/economic analyst for timber sale projects; one year as District Silviculturist.

Responsible for discussion of economic environment and analysis of the economic impacts of the alternatives.

**LUCY A. SALAZAR**
Forest Vegetative Management Specialist (1990-present). B.A., mathematics (1976). M.S., forestry, 1980. Relevant experience: 10 years as a Research Forester with Riverside Fire Lab, Pacific Southwest Forest and Range Experiment Station, USFS, investigating fire management planning concurrent with four years experience with GIS and fire/fuels applications.

Responsible for fire, fuels, and air quality discussions.

**FERNANDO A. SANCHEZ**
Forest Landscape Architect and Recreation Manager (1994-present). B.L.A., landscape architecture, 1969. Relevant experience: 23 years as a Forest Landscape Architect concurrent with 20 years as a Land Management Planning team member and Recreation Planner.

Responsible for visual quality discussions, wild and scenic rivers data.

**MARK E. SMITH**
Forest Geologist (1986-present). M.S., geology, 1975. Ph.D., earth resources, 1978. Additional courses in regional planning and soils engineering. Relevant experience: three years consulting in regional geologic hazard analysis; seven years as staff geologist.

Responsible for analysis of geologic resources and hazards, and monitoring discussions and plan.

**MEREDITH A. SMITH**
Realty Specialist (1987-present). B.A., home economics, 1962. Additional courses in environmental document writing, NEPA process, and public land law. Relevant experience: 10 years as Applications Examiner, writing Forest Service instruments and documents, concurrent with special use preparation and administration.

Responsible for writing and editing portions of the FEIS and Plan; provides data on land uses, status, and adjustments.

**KENNETH L. WILSON**
Heritage Resources Program Manager (1979-present); Acting Land Management Planning and Recreation Staff Officer (1990-1991). B.A., anthropology, 1972. M.A., anthropology, 1980. Relevant experience: seven years as private cultural resources consultant intermingled with duties as federal archaeologist.

Responsible for heritage resource discussions.

**KENNETH A. WRIGHT**
Forest Planning Analyst (1992-present). B.S., forest science, 1976. M.S., watershed management, 1987. Additional courses in NEPA, modeling, and soil and water monitoring. Relevant experience: two years as research hydrologist; six years as planning hydrologist concurrent with seven years as District earth scientist; one year as Forest Planner.

Responsible for performing technical analysis, linear modeling (FORPLAN), data base design and management, and GIS.

## RETIRED OR TRANSFERRED

The following individuals, who have retired or transferred from the Six Rivers National Forest, participated as members of the Planning Team during part of their tenure on the Forest.

Norman Carpenter, Forest Landscape Architect (detailer)
John Coburn, Planning Forester (retired)
Randy Ferrin, Planning Hydrologist (transferred)
Gail Grifantini, Forest Planner (transferred)
Danny Heavilin, Assistant Forest Planner (transferred)
Christopher M. Knopp, Forest Planner/Planning Hydrologist (transferred)

Jane LaBoa, Planning Forester (transferred)
Harold P. Luedtke, Planning Forester (transferred)
Owen A. Peck, Forest Planner (retired)
Shannon D. Quinsey, Operations Research Analyst (transferred)
Daniel Schlender, Forest Landscape Architect (transferred)
Joy Smith, Assistant Forest Planner (transferred)
David Solis, Wildlife Planning Biologist (transferred)
Ed Toth, Wildlife Planning Biologist (transferred)
Catherine Young, Cultural Resources Specialist (resigned)
Bob Zane, Program Analyst (transferred)

## INTERDISCIPLINARY TEAM

The Forest Interdisciplinary Team consists of the Forest Supervisor, Deputy Forest Supervisor, Forest Staff Officers, and District Rangers. The Interdisciplinary Team collectively represents the diverse specialized areas of professional and technical knowledge needed to develop the Forest Land Management Plan. The education and experience of each member of the Interdisciplinary Team pertinent to this planning effort are summarized below.

**MARTHA J. KETELLE**
Forest Supervisor (1994-present), Past Deputy Forest Supervisor (1991-1993). A.B., geology, 1967. M.S., water resources/geology, 1970. M.L.A., landscape architecture, 1976. Additional courses in facilitation. Relevant experience: four years as researcher in visual impact analysis and geologic investigations; 3 years as Congressional legislative staffer; four years as federal agency legislative liaison; four years as federal agency public liaison in environmental quality.

**MARCIA R. ANDRE**
District Ranger, Mad River Ranger District (1992-present). A.A., forest management, 1976. Additional courses in logging engineering. 15 years in various timber management positions.

**JEAN M. HAWTHORNE**
Public Services Staff Officer (1994-present), past Land Management Planning/ Recreation/ Heritage Resources Staff Officer (1991-1994). B.A., outdoor recreation administration, 1974. Relevant experience: six years as Forest Public Affairs Specialist with interpretive services, recreation, and human resource programs; six years as Regional Interpretive Services Program Leader with responsibilities for tourism, marketing, interpretive association management, visitor services, training, and HOST program.

**KATHLEEN HEFFNER McCLELLAN**
Forest Civil Rights Officer (1991-present). Five years of course work in administration and anthropology. Relevant experience: 14 years as cultural anthropologist working with contemporary Native American issues and uses of Forest lands.

**JOHN C. LARSON**
District Ranger, Orleans Ranger District (1978-1981; 1986- present). B.S., forest management, 1967. Additional courses in managing the NEPA process. Relevant experience: 14 years as District Ranger; 8 years in various timber management positions.

**GEORGE A. LOTTRITZ**
Natural Resources Group Staff Officer (1994 to present). Past Timber and Fire Staff Officer (1988-1994). B.S., forest management, 1967. Additional courses in ecology, silviculture, and the NEPA process, Region 5 Certified Silviculturist. Relevant experience: eight years as forester; three years as resource forester; 11 years as Forest Silviculturist.

**BRIAN N. MORRIS**

District Ranger, Gasquet Ranger District (1992-present). B.S., forest management 1967. Additional courses in recreation management. Relevant experience: five years as forester; two years as land use coordinator; five years as Resource Officer; two years as Recreation Officer.

**HAROLD L. SLATE**
Forest Engineer/Lands and Minerals Staff Officer (1990-present). B.S., civil engineering, 1973. Additional courses in managing the NEPA process. Relevant experience: six years in transportation planning; three years in facilities planning and development; four years in environmental engineering; four years as Assistant Forest Engineer.

## RETIRED OR TRANSFERRED

The following individuals, who have retired or transferred from the Six Rivers National Forest, participated as members of the Interdisciplinary Team during their tenure as line or staff officers on the Forest.

Robert S. Black, Forest Engineer/Lands and Minerals Staff Officer (retired)
C. Eugene Brock, District Ranger, Gasquet Ranger District (retired)
Floyd Damoth, Timber and Fire Management Staff Officer (retired)
James L. Davis, Forest Supervisor (retired)
Lawrence C. Cabodi, District Ranger, Lower Trinity Ranger District (retired)
Karen Caldwell, Acting District Ranger/NRA Manager Gasquet RD (transferred)
Linda C. Costanzo, Comptroller (retired)
Richard L. Gibson, Public Affairs Officer (retired)
Cynthia Henchell, Humboldt Nursery Manager (transferred)
Jack R. Kahl, Fish, Wildlife, Range, Ecosystems and Watershed Staff Officer (retired)
Tony Montana, Human Resources Officer (reassigned)
Owen A. Peck, Land Management Planner/Recreation Staff Officer (retired)
Anthony R. Ramirez, Humboldt Nursery Manager (resigned)
Julie Ranieri, Appeals/ Environmental Coordinator (reassigned)
Jan R. Seils, Deputy Forest Supervisor (retired)
Gretchen Smyth, Information Services Staff Officer (transferred)
Janice Stevenson, Acting District Ranger Mad River RD (reassigned)
Leah C. Stewart, Information Services Staff Officer (transferred)
Patricia C. Visser, Economic Development Specialist (reassigned)

## TECHNICAL SUPPORT

The planning process is supported by most Forest employees, either directly or indirectly. Many people provided the technical support necessary to complete the planning process and publish the documents: managing public involvement; reading, coding, and keying public input; gathering and analyzing data; writing, reviewing, and editing technical discussions; preparing graphics, text, and layout. Others provided support by filling in behind for those who were more intimately involved in the planning effort. Those who provided significant support are identified below.

Chris Adair, graphics and editing
Eric Brunner, timber
Bruce Bryan, vegetation mapping
Lori Damoth, data entry
Amy Dozier, writing/editing
Bruce Emad, socio-economic studies (private industry)
Mike Ericksen, CalVeg vegetation classification
Richard Farrington, geology
Marlette Grant, publishing
Cheryl Gruenthal, wildlife biology
Todd Healy, writer/editor
Sherry Hirst, data base queries
Ken Hoffman, editing, wildlife modeling
John Hunter, wildlife biology
Jeff Jones, vegetation mapping
Tom Keter, archaeology
Don Kudrna, wildlife biology
Diane Kunes, computer maps
Nora Laughlin, lands; landscape architect
John McCrae, botany
Dennis McKinnon, maps & desktop publishing
Pat Manley, wildlife biology
Scott Miles, soils
Joan Naszady, wildlife biology
Susan O'Donnell, graphics & tables
Gayle Otero, wildlife biology
Steve Pollard, vegetation mapping

# LIST OF AGENCIES, ORGANIZATIONS AND PERSONS TO WHOM COPIES OF THE STATEMENT WERE SENT

Copies of the planning documents were sent to the agencies, organizations, and individuals listed below. This list is not intended to be complete, but gives an indication of the number of copies that have been distributed. The complete mailing list is on file at the Supervisor's Office, 1330 Bayshore Way, Eureka, CA.

## FEDERAL AGENCIES

***AGRICULTURE, US DEPARTMENT OF***

USDA Forest Service, WO,
USDA Forest Service, Region *5*
Redwood Sciences Laboratory
Angeles National Forest
Cleveland National Forest
Eldorado National Forest
Inyo National Forest
Klamath National Forest
Lake Tahoe Basin
Lassen National Forest
Los Padres National Forest
Mendocino National Forest
Modoc National Forest
Plumas National Forest
San Bernadino National Forest
Sequoia National Forest
Shasta-Trinity National Forests
Sierra National Forest
Siskiyou National Forest
Stanislaus National Forest
Tahoe National Forest

**Six Rivers NF Ranger Districts**

Lower Trinity Ranger District
Mad River Ranger District
Orleans Ranger District
Smith River NRA

### *OTHER FEDERAL AGENCIES*

Environmental Protection Agency
US Department of Commerce
US Department of Interior, Env. Pollution
US Department of Transportation
Redwood National Park
US Dept of Interior Fish and Wildlife

## CHAMBER OF COMMERCE

Crescent City Del Norte County

## CITIES

Humboldt Bay Municipal Water District

## COLLEGES, SCHOOLS AND UNIVERSITIES

College of the Redwoods
Humboldt County Office of Education
Humboldt State University
- Biology Department
- College of Behavioral Science
- Forestry Department
- Library Documents
- Rangeland Resource Science

Oregon State University
Santa Rosa Junior College
University of California
University of California Coop Ext.
University of California

## COUNTIES

County of Del Norte
Del Norte County Board of Supervisors
Humboldt County Assessor
Humboldt County Board of Supervisors
Trinity County Board of Supervisors

## FEDERAL OFFICIALS

Senator Barbara Boxer
Senator Diane Feinstein
Congressman Frank Riggs

## LIBRARIES

California State Library
Humboldt County Library
Humboldt State University
Trinity County Library

## LOCAL OFFICIALS

City of Fortuna

## NATIVE AMERICAN ORGANIZATIONS

Hoopa Tribe Fisheries
Karuk Tribe
Tsnungwe Tribe
Yurok Tribe

## NEWS MEDIA

KCRE/KFVR
KMUD News
Off Road Advertiser
Times Standard

## ORGANIZATIONS AND BUSINESSES

Attorney at Law
Leopold Club
ALTA California
American Motorcyclist Association
American Rivers
Ancient Forest International
Back Country Horsemen of California
Back Country Horsemen of California Redwood Unit
Big River Associates
Blue Lake Forest Products
CERA
COR VA.
California Forestry Association
California Native Plant Society
California Trout Incorporated
California Wilderness Coalition
Californians for Alternatives To
Central Sierra Environmental Resources
Chino Lumber and Hardware
Corning Truck and Radiator Service
Del Norte Taxpayers League
Ecology Center
Eel River Sawmills
Eureka Printing Company
Freshwater Farms Inc
Friends of the River
Gates Insurance Agency
Gentry and Gilliam
Hi Ridge Lumber Company
Humboldt County Taxpaycrs
Klamath Forest Alliance
Laughing Heart Adventures
Mattdle Salmon Group
Mendorino Forest Watch
Napa Solano Audubon Society
Native Plant Society of Oregon
Natural Resources Management Corporation
Northcoast Environmental Center
Nycal Corporation
Off Road Advertiser
Pacific Coast Farm Credit Service
Pacific Gas and Electric Company
Pacific Lumber Company
Pacific Northwest 4WD Association
Polar Equipment Company
Redwood Resources Ltd
Reservation Ranch
Ridge Runners
Rosehurg Forest Products
Rough and Ready Lumber Company
Southern Oregon Timber Industries
STRA, Energy & Environmental Division
Saltman & Stevens PC
Sandy Bar Ranch
Scenic Shoreline Preservation Conf
Schmidbauer Lumber Incorporated
Sierra Club
Sierra Club Legal Defense Fund
Sierra Pacific Industries
Simpson Timber Company
Siskiyou Regional Education Project
South Fork Trinity Up-River Friends
Stone Forest Industries
The ‘Wilderness Society
Trout Unlimited
United Four Wheel Drive Association
W.D. Olsen & Assoc
Wnett Institute
Woodward Clyde Consultants

## STATE AGENCIES

Jackson State Forest
California Conservation Corps
California Department of Fish and
California Department of Fish and Game
California Department of Forestry
Humboldt Del Norte Ranger Unit
California Department of Parks and Recreation.
California Farm Bureau Federation
California Water Quality Control Board
California Department of Water Resources

## STATE OFFICIALS

Assemblyman Dan Hauser
State Senator Mike Thompson
Governor Pete Wilson

# INDIVIDUALS

William Ahrens
John Alexander
Janice Andersen
Virginia Anthony
Wallace Appleton
Neal Austin

Mark and Melinda Bailey
William Barnum
David Barron
Joseph Barrote
Andy Bartson
William Baumgartner
Jacques Beaupre
Rudolf Becking
John Beite
Charles Benhow
Steve Benson
Steven Berry
Karl Beyerle
Greg Blomstrom
Joseph Bower
Thomas and Pamela Branch
James Broshears
Karl Brown
Tom Brundage
Karen Bulinski
Ross Burgess
Christopher Burke
Truman Burns

Bruce Campbell
Keith Carlson
William Carlson
Carlos Carroll
Tory Ceschi
Robin Chapman
Steen Christensen
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